China Resources Construction Company Limited

Maunsell

Contract No. SS M333

Reprovisioning of Diamond Hill Crematorium

Environmental Management Plan

January 2007

Reviewed by (PM):	Checked by:	Approved by: (Environmental Team Leader)

Report Version:	Revision 3.2	Date of Submission:	10 January 2007

MAUNSELL ENVIRONMENTAL MANAGEMENT CONSULTANTS LTD
11/F, Grand Central Plaza, Tower 2, 138 Shatin Rural Committee Road, Shatin, NT, Hong Kong
Tel: (852) 2893 1551 Fax: (852) 2891 0305 Email: mem@maunsell.com.hk

Hyder Consulting

安誠工程顧問有限公司
香港灣仔
皇后大道東183號
合和中心47樓
電 話: (852) 2911 2233
圖文傳真: (852) 2805 5028
電子郵箱: hyder.hk@hyderconsulting.com
網 址: www.hyderconsulting.com

Hyder Consulting Limited
47/F Hopewell Centre
183 Queen's Road East
Wan Chai, Hong Kong
Tel : (852) 2911 2233
Fax : (852) 2805 5028
Email: hyder.hk@hyderconsulting.com
Website: www.hyderconsulting.com

Hyder Consulting Limited is incorporated in Hong Kong with limited liability. COI Number 126012

11 January 2007

BY POST & FAX (2524 8194)

Architectural Services Department
Queensway Government Offices
66 Queensway
Hong Kong

Your Ref:

Our Ref: 1148-05/E07-1793

For attention of Mr Michael Mak

Dear Michael

Reprovisioning of Diamond Hill Crematorium
Environmental Management Plan (Revision 3.2)

We refer to the email of 10 January 2007 with the enclosure of the Environmental Management Plan (Revision 3.2) from MEMCL.

We have no comment and hereby verified the captioned document.

Should you have any queries, please do not hesitate to contact the undersigned on 2911 2739 or Adi Lee on 2911 2729.

Yours sincerely

Coleman Ng
Independent Environmental Checker
HYDER CONSULTING LIMITED

cc MEMCL – Mr. Y. T. Tang/Mr. Kenneth Lau (Fax: 2891 0305)
CRCCL – Mr. Whyment Leung (Fax: 2827 2921)

ON/ALE

TABLE OF CONTENTS

LIST OF TABLES

List of Figures

Appendices

1. INTRODUCTION

Background

1.1 China Resources Construction Company Limited (the Contractor) was commissioned by Architectural Services Department of Hong Kong Special Administrative Region (HKSAR) to carry out works under Reprovisioning of Cremators at Diamond Hill Crematorium (hereinafter called the "Project") in September 2004.

1.2 According to Part 4 Clause 4.3 of the Environmental Permit (EP) (No. EP-179/2004/B), Environmental Management Plan (EMP) should be submitted at least one month before the commencement of the commissioning tests of the new cremators. This EMP covers the management practices and measures to be carried out during the commissioning and operation of the new cremators to ensure the long term operation of the crematorium will satisfy the legislation and regulations.

1.3 Under the EP requirement in Clause 4.3, Environmental Management Plan (EMP) should be prepared by the Contractor, verified by the IEC as conforming to the information and recommendations contained in the approved EIA Report (Register No. AEIAR-076/2004). Maunsell Environmental Management Consultants Limited (MEMCL) (hereinafter called the "ET") was appointed by China Resources Construction Company Limited to provide professional services with respect to environmental management and compliance for the Project.

2. ENVIRONMENTAL PROJECT MANAGEMENT

2.1 This section provides an overview of the management and organisation hierarchy that China Resources Construction Limited has set up to manage environmental affairs for the Project. This section contains an organisation structure of environmental staff, their respective roles and responsibilities and an outline of the communication procedures.

Project Organisation for Environmental Management

2.2 Project Organization for Environmental Team is shown in Figure 2.1 and Key Contacts of Environmental Personnel of the Project are shown in Appendix A.

Roles and Responsibilities of Key Environmental Personnel

Architect's Representative (AR)

2.3 The AR should:

- Supervise the Contractor's activities and ensure that the requirements in the EM&A Manual are fully complied with;
- Inform the Contractor when action is required to reduce impacts in accordance with the Event and Action Plans;
- Employ an Independent Checker (Environment)(IEC) to audit the results of the EM&A works carried out by the ET;
- Adhere to the procedures for carrying out complaint investigation accordance with the EM&A Manual.

The Contractor

2.4 The Contractor should:

- Employ an Environmental Team (ET) to undertake monitoring, laboratory analysis and reporting of environmental monitoring and audit;
- Work within the scope of the construction contract and other tender documents;
- Participate in the site inspections undertaken by the Environmental Team (ET) and Independent Environmental Checker (IEC) as required and implement the corrective actions instructed by the Engineer;
- Provide staff training to Food and Environmental Hygiene Department (FEHD) (operator in operation phase);
- Carry out complaint investigation and implementation of mitigation measures during testing and commissioning phase.

Environmental Team (ET)

2.5 The designated ET is Maunsell Environmental Management Consultants Limited (MEMCL), an independent environmental consultant employed by the Contractor. The ET's responsibilities include:

- Designate an ET Leader to fulfil the General Condition 2.1 of the Environmental Permit EP-179/2004/B. The ET Leader will certify or verify any environmental submissions as required by the EP-179/2004/B;
- Provide specialist advice on all environmental issues to the Contractor;
- Monitor the various environmental parameters as required by the EM&A Manual;
- Conduct site inspections and investigate and inspect the Contractor's equipment and work methodologies with respect to pollution control and environmental mitigation stipulated in the EMP, and to anticipate environmental issues that may requirement mitigation before the problem arises;
- Review the programme of works, in order to anticipate any potential environmental impacts before they arise;
- Review the construction method statements and provide comments on the method statements to the Contractor;
- Audit the environmental monitoring data and report the status of the general site environmental conditions and of the implementation of mitigation measures resulting from site inspections;
- Report the EM&A results and the wider environmental issues and conditions to the Contractor and Engineer;
- Prepare EM&A reports as required in the EM&A Manual;
- Follow the procedures stipulated in the agreed Event and Action Plans in the event of exceedance, non-compliance or complaint.
- Carry out complaint investigation and implementation of mitigation measures during testing and commissioning phase.

Independent Checker (Environment) (IEC)

2.6 The IEC should:

- Review the EM&A works performed by ET;
- Audit the monitoring activities and results;
- Report the audit results to the AR and EPD in parallel;
- Review the proposal on mitigation measures submitted by the Contractor in accordance with the Event and Action Plan.
- Carry out complaint investigation and implementation of mitigation measures during testing and commissioning phase.

Food and Environmental Hygiene Department (operator during operation phase)

2.7 The Operator should:

- Conduct regular environmental monitoring during operation phase including odour and air;
- Provide adequate maintenance to the cremators;
- Manage joss paper burners and ensure the proper operation of the crematorium and the air pollution control system during operation;
- Waste Management including ash and non-combustible, chemical waste, general refuse;
- Dangerous goods storage, handling, labeling and spill prevention;
- Conduct continuous monitoring in primary combustion zone, outlet from secondary combustion zone, oxygen and carbon monoxide concentration at the outlet of the secondary combustion zone according to the Specified License (under the APCO).
- Carry out complaint investigation and implementation of mitigation measures during operation phase.

3. COMMISSIONING SCHEDULE AND ADMINISTRATIVE ARRANGEMENT

3.1 Commissioning Schedule / Administrative arrangement to ensure no more than 6 cremators (new and old cremators) would be in operation during commissioning phase.

3.2 As per EIA clause 4.5.11, the Existing Crematorium would still be operating to serve the public during the testing and commissioning of the new cremators. However, special arrangement would be made to ensure there would be no more than six cremators in operation at any time (no more than 6 of both existing and new cremators will be in operation at the same time) during this period to avoid additional loading of chimney emissions to the environment.

3.3 During commissioning phase of the new crematorium, the commissioning schedule should be such that only 3 new cremators would be tested and commissioned each time so that 3 old cremators can still be in operation to serve the public.

3.4 Tentative commissioning schedule would be prepared so that all relevant parties are well aware of the commissioning schedule and arrangement.

3.5 FEHD staffs of the existing crematorium would be informed at least 3 weeks in advance before the testing and commissioning of the new cremators so that FEHD can stop the booking of old cremators. The testing & commissioning run of the new cremators can only be started upon formal confirmation from FEHD.

3.6 Figure 3.1 shows the Replacement of Cremators at Diamond Hill Crematorium Testing and Commissioning Programme.

4. OPERATOR STAFF TRAINING

4.1 Operator staff training will be arranged by the Contactor during cremator testing and commissioning period to give a throughout understanding of the cremation system operation to EMSD & FEHD operation personnel. 4 days training schedule contents and target attendant are as follows:

Table 4.1 Operator Staff Training Schedule

1st Day	Theoretical Part	Target Attendant
90 min	*Introduction to the Environmental Permit (EP No.-179/2004/B) and Specified Licence (L-12-006(1)), this introduction covers the management practices and measures to be carried out of the new cremators to ensure the long term operation of the crematorium would satisfy the legislation and regulations.* *Introduction to the basics of the overall procedure of the cremation line and process* *Brief description of the cremation process* Presentation of the procedure's basics, including the following downstream components: ▫ Cremator - Main combustion - Secondary combustion - Mineralisation - Rotary plate system ▫ Heat Exchanger - 1st water stage - Air preheater - 2nd water stage - Radiator & hot water system ▫ Fibre filter system - Design - Dust flow process within the filter system - Chemical additive consumption - Reactor & cyclone separator operation principle ▫ Flue Gas Fan - Control ▫ Chimney Stack ▫ Compressed air system ▫ Diesel fuel supply ▫ Forklift, Catafalque & Automatic Guided Vehicle ▫ Cremulator ▫ Computer control & SCADA system ▫ Continuous emission monitoring system	Technical Management Service Personnel Operating Personnel
45 min	Having a look around the plant. Inspection of the above mentioned single components including the explanation of function and tasks of theirs during the cremation process ▫ Practical part of the previous theoretical introduction into the basics of the overall procedure of the cremation line	Technical Management Service Personnel Operating Personnel
15 min	Break	

60 min	Introduction to the charging or insertion ▫ Allowed Coffin Structure / Oven Size ▫ Allowed Coffin Interior Fittings ▫ Handling of Coffin Metal Fittings ▫ Co-ordination Coffin Sizes – Oven 170kg ▫ Co-ordination Coffin Sizes – Oven 250kg ▫ Charging Coffin – Forklift, Insertion Machine & AGV	Technical Management Service Personnel Operating Personnel
15 min	Question & Answer Session	Technical Management Service Personnel Operating Personnel
60 min	Lunch Break	
90 min	Introduction to the handling of the cremation line – according to the operating instructions ▫ Conditions before Daily Operation ▫ Switch-On for Operation ▫ Switch-Off after Operation - Daily Switch-Off - Switch-Off for Longer Downtime - Switch-Off for Repair Works ▫ Charging ▫ Launching / Execution of Cremation Process ▫ Temperature Flow ▫ Duties & obligations of crematorium operator under EPD SP Licence's terms and conditions	Technical Management Service Personnel Operating Personnel
45 min	Introduction to the cremation line's maintenance – according to the maintenance instructions. Routine & scheduled maintenance. Stock keeping on spare parts, special tools & consumables	Technical Management Service Personnel Operating Personnel
15 min	Break	
45 min	Occurring Malfunctions ▫ Right Reaction ▫ Proceedings ▫ Eventual Repair of Malfunctions ▫ Further Measures ▫ Emergency Operation ▫ Introduction of Common Faults ▫ Trouble Shooting Techniques	Technical Management Service Personnel Operating Personnel
45 min	Question & Answer Session	Technical Management

		Service Personnel Operating Personnel

2nd Day	**Practical Part**	
90 min	Introduction to the handling of the cremation line – according to the operating instructions – without an insertion ▫ Practical repetition of the theoretical part	Technical Management Service Personnel Operating Personnel
15 min	Break	
90 min	Introduction to the handling of the cremation line – according to the operating instructions – with an insertion ▫ Cremation (Operating Personnel)	Technical Management Service Personnel Operating Personnel
30 min	Question & Answer Session	Technical Management Service Personnel Operating Personnel
60 min	Lunch break	
120 min	Cremations ▫ Normal operating sequence of the crematorium would be introduced, training level suitable to service and operating personnel, ▫ Under Manufacturer Personnel's instruction	Service Personnel Operating Personnel
15 min	Break	
60 min	Cremations – continue ▫ Normal operating sequence of the crematorium would be introduced, training level suitable to service and operating personnel, ▫ Under Manufacturer Personnel's instruction	Service Personnel Operating Personnel
30 min	Question & Answer Session	Service Personnel Operating Personnel

3rd - 4th Day	Practical Part	
16 Hours	Cremations ▫ Normal operation, operating sequence of the crematorium under Manufacturer Personnel's instruction ▫ Repair of simulated malfunctions ▫ Maintenance & hand on operation of AGV ▫ Maintenance / daily checking of water system ▫ Maintenance / daily checking of compressed air system	Service Personnel Operating Personnel

5. OPERATION, MONITORING, MAINTENANCE AND MANAGEMENT PROCEDURES

Operation Procedures for New Cremators

5.1 Only trained personnel are allowed to operate this system.

5.2 The system may only carry out cremations of human bodies and coffins, accessories and clothing according to Hong Kong EPD, *A Guidance Note on the Best Practicable Means for Incinerators (Crematoria) BPM 12/2(06)* and *CAP 132M Cremation and Gardens of Remembrance Regulation of Hong Kong.*

5.3 The coffins which are to be cremated must be at least 440mm wide at the feet board for the 170 kg cremator and 540mm wide for the 250 kg cremator. The coffin max. size would be 990mm (W) x 860mm (H) x 2400mm (L) for 250 kg cremator and 760mm (W) x 760mm (H) x 2200mm (L) for 170 kg cremator. The maximum weight would be 250 kg for 250kg cremator and 200 kg for 170 kg cremator.

5.4 In order to guarantee an exact insertion operation or to be able to place the coffin exactly on the coffin support bricks, a suitable auxiliary board – about 500 x 500 mm has to be placed underneath the coffin, if it does not have the above mentioned minimum width. (about 500 x 500 for the 170 kg cremator and about 800 x 500 for the 250 kg cremator).

Commissioning

5.5 Care must be taken that the insertion door as well as all cleaning and inspection openings are closed.

5.6 Check the dust containers underneath the waste gas cleaning system to see if they fit tightly.

5.7 Place an empty cremain collector tray and cremain urn in the cremulator.

5.8 Open shut-off equipment for burners and turn the main switch at the control panel to position 1 (On). Switch on the computer and the monitor.

Pre-heating

5.9 Call up F3-status with the mouse, for operation mode click Auto and for system condition click On.

5.10 Now the cremator heats itself up time-dependently to the required temperatures:

- Primary combustion : 650 °C
- Secondary combustion chamber: 850 °C

5.11 The temperature is maintained automatically after one cremation process has been completed until the system is cleared for the next process.

Cremation

5.12 After completed insertion the cremation process takes place automatically.

5.13 The operator determines the end of the cremation after visually checking the progress. Then the screen F2 – System must be activated and the button F12 – Process end must be selected with the mouse in order to finish the cremation.

5.14 After the process end has been activated, the next insertion can be initiated. After the cremation phase the mineralisation takes place on the second rotary plate in the middle, which will turn automatically after the duration of the mineralisation.

5.15 The lids of the cremulators must be closed.

Shut-down

5.16 Activate the button F3 – Status with the mouse and for system condition select position "Off".

5.17 This would not influence a cremation process that has already begun. The command "System Off" only becomes active after F12 – process end has been activated and the subsequent mineralisation phase is completed.

5.18 After that, the additional firing system is switched off and the system switches itself off temperature-dependently.

Operation Requirements

5.19 Throughout the whole cremation cycle, starting from the loading of coffin for cremation up to the completion of the cremation, flue gases leaving the secondary combustion chamber would be held at not less than 850 degree Celsius for a minimum of 2 seconds in the secondary combustion chamber before entering the heat exchanger.

5.20 The oxygen content of the flue gases at the outlet of the secondary combustion chamber of the cremators would not be less than 6 percent by volume on a wet basis at all times throughout the whole cremation cycle, starting from the loading of coffin for cremation up to the completion of the cremation.

5.21 The loading of coffins to the cremators would only be carried out when the secondary combustion chamber temperature exceeds 850°C. An electrical interlock shall be provided such that the charging door can only be opened when the secondary chamber temperature is higher than 850°C.

5.22 At the beginning of each shift, the operator would check and ensure that sufficient quantity of chemical additive is loaded into the reactor when the cremators are preheated.

Air Monitoring for New Cremators

5.23 According to the Specified Process Licence (L-12-006(1)), continuous monitoring, source pollutants monitoring and commissioning stage emissions monitoring would be carried out by operator.

General Conditions of the Air Monitoring for New Cremators

5.24 Monitoring of the particulate, hydrogen chloride, carbon monoxide, gaseous and vaporous organic substances, mercury, dioxins, nitrogen oxides and smoke opacity would be carried out according to the Specific Process License.

5.25 The operator would not emit air pollutants in any significant quality except only from the emission points numbered EP1 to EP6 and DG1 (hereunder referred to as the "emission points"), a total of 7 points were identified.

5.26 Except in the event of a failure of the concerned process equipment or air pollution control equipment of the cremators numbered 1 to 6 (hereunder referred to as the "cremators) and the emergency generator, the operator would not emit any air pollutants at levels exceeding the emission limits in Appendix B.

5.27 Ringelmann Chart or and equivalent would be used for the comparison with smoke emission from the emission points EP1 to EP6 and DG1, which would not appears to be as dark as or darker than shade 1 on the Chart.

5.28 The temperature of the exhaust gas stream, the height and the diameter of the emission points should not be less than the specified in Appendix C.

5.29 The operator would not use light diesel oil having sulphur content exceeding 0.005% by weight or viscosity exceeding 6 centistokes at 40 degree Celsius as the fuel for the cremators.

5.30 The operator would only use light diesel oil having sulphur content not exceeding 0.005% by weight, viscosity not exceeding 6 centistokes at 40 degree Celsius and ash content of 0.01% as the fuel for the emergency generator.

Continuous Monitoring of the Air Monitoring for New Cremators

5.31 The operator would maintain in good condition at all times recording devices to record the following parameters for continuous air monitoring:

- Temperature inside the primary combustion chamber;
- Temperature inside the secondary combustion chamber;
- Temperature of flue gas at the outlet of the secondary combustion chamber;
- Temperature of flue gas at the outlet of the waste flue gas fan;

- Oxygen concentration at the outlet from the secondary combustion chamber;
- Oxygen concentration at the outlet of the waste flue gas fan;
- Carbon Monoxide concentration at the inlet of the flue gas filtering system;
- Carbon Monoxide concentration at the outlet of the waste flue gas fan;
- Hydrogen chloride concentration at the outlet of the waste flue gas fan;
- Organic compounds concentration at the outlet of the waste flue gas fan, and
- Opacity at the outlet of the waste flue gas fan.

5.32 The continuous monitoring equipment would be properly maintained and regularly calibrated. For gaseous and opacity measurement equipment, zero and span checks would be carried out every 24 hours or at other interval according to manufacturer's recommendation. The calibration records would be retained and assessable at all times for inspection on request by the Authority for less than 2 years from the date of recording.

5.33 Apart from the zero and span checks, the operator would conduct regular quality control check on the continuous emission monitoring equipment at 6 months interval. Operator would carry out the inspection and maintenance, replacement of spare parts and consumables and calibration of the equipment using compressed gases with known concentration. Moreover, operator would submit to the authority a report of the quality control check including the findings from the inspection maintenance and the calibration results of the emission monitoring equipment.

5.34 The opacity monitoring equipment or device would automatically activate and visual alarm for operator's attention whenever the opacity reaches or exceeds 20 percent.

5.35 A fault in the flue gas filtering system including the bag filter, a failure of conditioning rotor or chemical additive recycle screw conveyor pump would immediately trigger off an audible and visual alarm for operator's attention.

5.36 For each cremator, the operator would keep daily log of differential pressure across fabric system, operation status of conditioning rotor and chemical additive recycle screw conveyor pump and the amount of chemical additive injected to the reactor at the beginning of each shift. The records would be retained and accessible at all times for inspection on request by the Authority for not less than 2 years from the date of recording.

5.37 The operator would install and operate a telemetry system acceptable to the Authority to transmit instantaneously and continuously the readings of all parameters as mentioned in 5.31 to the office of the Authority. The alarm signals as mentioned in 5.34 and 5.35 herein would be transmitted to the Authority via the telemetry system.

5.38 The operator would submit to the Authority, on a quarterly basis, a written summary of monitoring results as mentioned in 5.31 and 5.36. The operator would include in the summary of the daily operation hours, number of coffins cremated and the light diesel oil consumption of the cremators.

5.39 A properly grounded 13 amperes electricity supply at 220 volts would be provided near the sampling point. Adequate rigid support, eyelet or similar device would be provided at each sampling point to facilitate wire support for the sampling equipment weighting about 70 kilogrammes. The internal diameter of the hole of the eyelet would be minimum 14 millimetres with its center 75 millimetres from the edge.

Source Monitoring of the Air Monitoring for New Cremators

5.40 The operator would provide and maintain in good condition at all times sampling points serving the emission points EP1 to EP6. A safe access to the sampling points together with a platform would be provided whenever source sampling is performed. The platform would have a minimum working area of about 3 square metres.

5.41 The operator would conduct source samplings to determine the concentrations and mass emission rates of the air pollutants in the flue gases emit from the cremators during their normal operations. The sampling serves to monitor air pollutants associated with the cremation process, and where the emission limits have been set out in Appendix B. Operator would notify EPD according to 6.3 when the emission limit is exceeded.

5.42 Source sampling and subsequent laboratory analysis would only be carried out by laboratory with proven quality assurance and experience. Source sampling would be conduces at the sampling points as mentioned in 5.40.and sampling frequency shows in Appendix D.

5.43 The operator would inform the Authority in writing of the schedule of the sampling at least one week before is carried out.

5.44 Gas sample would not be taken before the coffin is charged into the combustion chamber. The sampling should commence as soon as stable conditions are achieved inside the cremator after the coffin is charged into the combustion chamber, and complete or interrupt before the process of removing the ash from the combustion chamber commences.

5.45 Except for dioxins and mercury, each gas sample would cover for one hour and the sampling should be completed within one cremation cycle.

5.46 For the measurement of dioxins and mercury, each gas sample would last for minimum of 3 complete cremation cycles or the requisite number of complete cremation cycles to cover a minimum period of 6 hours, whichever is longer duration. Sampling would be interrupted during the idle time between two cremations.

5.47 High-resolution gas chromatograph and high-resolution mass spectrometer (HRGC/HRMS) would be used in the analysis of dioxin sample. Detailed laboratory analytical results of polychlorinated dibenzodioxins (PCDDs) / polychlorinated dibenzofurans (PCDFs) would be provided in the sampling report.

5.48 Detailed sampling data and calculations to show the emission concentration and emission rate would be provided in the test report within 30 days after the sampling.

Commissioning Stage Monitoring of the Air Monitoring for New Cremators

5.49 The operator would conduct a commissioning test before the operation of the cremators to demonstrate that the process equipment and air pollution control equipment including cyclone separator, chemical additive injection system, reactor and fabric filter system are functioning properly.

5.50 The operator would conduct air pollutant sampling exercise at the sampling points during the commissioning test of the cremators to determine its concentration and mass emission rate. At least two samples for dioxins would be taken for each cremator during the commissioning test.

5.51 Other requirements for the sampling exercise this stage would be in accordance with 5.44-5.48.

5.52 The Commissioning test would be witnessed by the authority. The operator would inform the Authority in writing of the schedule of the commissioning test at least one week before it is carried out. The report of the test would be submitted to the Authority within one month after the sampling.

Inspection on Landscape and Visual during Operation Phase

5.53 Tree felling and transplanting operations to ensure the correct trees are felled, prepared and transplanted in accordance with the landscape specification and agreed transplant locations.

5.54 Existing planting to be retained is properly protected by hoarding, or other means specified, at the commencement of the works and such protection measures are properly maintained throughout the construction period.

5.55 Any topsoil excavated during construction is carefully saved and stored to one side of the works area for reuse upon completion.

5.56 New planting is provided in accordance with the specification and detailed planting plan.

5.57 Growth of plants in accordance with the landscape plan to make sure mitigation method is effective and the landscape enhanced after the first, the sixth and the twelfth month of the completion of all recommended planting works.

5.58 Inspection on landscape would be carried out according to the Environmental Impact Assessment Report.

Maintenance Procedures for Cremation System

5.59 For the preventive maintenance procedures, instruction and frequency of the cremation system, please refer to Appendix F.

Maintenance for Emergency Generator

5.60 The operator should perform the routine monthly off-load testing of the emergency generator

within half an hour between 1400 and 1600 hours on Sundays and Public Holidays only.

5.61 The emergency generator and its associated equipment would be properly maintained and regularly inspected. The inspection and testing records should be retained and accessible for inspection on request by the Authority for not less than 2 years from the date of recording.

Management of Joss Paper Burners

5.62 According to the planning of the New Crematorium, 4 units of joss paper burners installed near the service halls for Chinese memorial ceremonies. Assuming 6 cremation time slots are available a day, the duration of a typical memorial ceremony is 20 minutes and the burning material is about 0.5 kg, taking average of 36 cremation sessions daily, a total of 18 kg of burning material will be combusted in the 4 incense burners.

5.63 In order to reduce the nuisance due to the emissions from joss paper burners, administrative mitigation measures would be adopted as follows:

- FEHD would limit the use of joss paper burners. Joss paper burners would be only allowed for the use of memorial ceremonies upon request by the relatives;
- Guidance would be provided to the users to advise them to minimize the quality of burning materials;
- FEHD staff would advise the users to ensure better combustion of the joss paper in order to reduce smoke emission.

5.64 It is anticipated that the emission of air pollutants would be much improved by administrative management measures to reduce the usage of joss paper burners to minimal and to improve the combustion efficiency. Whenever necessary, FEHD would advice users to reduce the quantity of burning materials through proper education channels.

Management of Fuel Storage Tank

5.65 A total of three diesel fuel tanks in the new crematorium.

- One underground fuel tank with capacity of 30,000L.
- One daily service fuel tank (above ground) for cremators, located east of the radiators with capacity of 2,000L.
- One fuel tank (above ground), with capacity of 2,000L, for emergency generator next to the emergency generator room.

5.66 The fuel storage facilities to be provided in the New Crematorium are constructed, maintained and inspected in accordance with the provisions of the Dangerous Goods (General) Regulations (Cap. 295B) and the guidelines presented in "Guidance for the Design, Construction, Modification and Maintenance of Petrol Filling Stations" (Institute of Petroleum, 1999), and with the necessary approvals from the Fire Services Department. To mitigate the environmental impacts from operational land contamination, the following mitigation

measures would be implemented for installation and operation of any underground fuel tank:

- The underground fuel tank is buried underground in concrete chamber with vent pipe and placed within a concrete pit to avoid direct contact of the tank surface with soil.
- The concrete pit would be accessible to allow tank integrity test to be carried out on an annual basis, or when deemed necessary by an independent qualified surveyor or structural engineer. Any potential problems such as potential cracking shall be rectified as far as practicable.
- Diesel fuel pipelines are installed above ground and trenches are provided to contain the pipelines. The distance between the cremators and the underground tanks is minimized as appropriate to avoid the need for long pipelines.
- Proper installation of meters (at the two ends of any pipeline) allow any unexpected pressure drop or difference and signs of leakage be detected from routine inspection or during diesel fuel pumping. Any identified leakage would be reported to the plant manager in-charge.
- Any spillage of fuel would be removed immediately by portable pump when the quantity is large or by absorbing materials when the quantity is low or with similar effective tools as appropriate. Used absorbing material would be properly stored and disposed of as chemical waste.
- The underground tank refilling (from tank trucks) would only be undertaken by authorized staff of the fuel company using the company's standard procedures to avoid spillage of diesel fuel.

5.67 Provided the above measures are implemented properly, the likelihood of uncontrolled leakage of fuel giving rise to land contamination is low. If in the future such facilities are decommissioned, contamination testing will be required in order to identify and delineate any contamination that may have occurred. No additional land contamination impacts are envisaged during the transitional stage of the Project.

5.68 For the maintenance procedures of three fuel storage tanks are basically follow the manufacturer's maintenance instructions manual and some general inspection steps are shown as follow:

- To check for any signs of corrosion and crack on oil supply pipes;
- To check for any oil leakage at pipe, joint and hose connections;
- Remove sediments from fuel filter;
- To check the function of oil ruler of fuel storage tank, calibrate and adjust as required;
- To check the operation of the fuel pump and ensure in good condition, repair as required.

Management of Waste Gas Cleaning (Air pollution Control) System

5.69 The waste gas cleaning system consists of cyclone, chemical additive injection system and a bag filter for a separation of fine dust from the waste gas.

5.70 In the cyclone, coarse particles are separated into a dust bin, which is connected to the cyclone via a sack buckle. Then the waste gas is led through the insulated raw gas pipe through the ball reactor. Here, an additive (Sorbalit® 30% - a mixture of lime and 30% furnace coke) is added to the waste gas. The additive is circulated in the ball rotor and thus can be optimally used and the residue per cremation is reduced. Next, the dust contained in the waste gas is separated in the bag filter. A filter cake forms on the filter bags made from aramid needle felt. The height of the filter cake influences the pressure differential over the filter. The periodical cleaning of the filter bags is controlled by pressure differential and consists of a reverse blowing of compressed air through the filter bags (operating pressure 6 bar minimum). The filter dust is transported into a dust bin via a conveyor worm. The remaining substances from the ball reactor are transported into the same dust bin via a worm as well.

5.71 The operation, management and maintenance procedures for air pollution control system are listed in Appendix G.

Control of Fugitive Emission

5.72 The removal of human remains after cremation and the subsequent handling and storage of such cremains would be carried out without emitting particulates. The operator would store waste from the cremains processing device in sealed plastic bags and covered boxes for disposal.

5.73 During the operation of cremators, the primary and secondary combustion chambers would be monitored to confirm being tightly sealed and air pollution control equipment would be in operation to prevent fugitive emissions and leakage from the combustion chambers.

5.74 The maintenance of the flue gas filtering system comprising the waste flue gas fan, flat bag filter, reactor and cyclone and connecting ductwork, the replacement of filter bag and the discharge of particles collected by the cyclone would be carried out without emitting particulates. Sealed plastic bags and covered containers would be used for storing and disposing particles collected by the cyclone and bag filter.

6. EVENT CONTINGENCY PLAN

6.1 Air pollution control equipment, including the cyclone chemical additive injection system, flue gas filtering system comprising the waste flue gas fan, flat bag filter, reactor and cyclone and connecting duck work, as well as its ancillary equipment such as heat exchanger would be maintained in good condition and put into use whenever the cremators are in operation.

6.2 When there is a failure of the process equipment or air pollution control equipment, the operator would take all practicable measures to minimize the quantity and duration of emission of air pollutants and/or smoke from the concerned cremator. The operator should observe the following requirements:

- If the concerned cremator is not in operation when the event of the failure occurs, the operator would not operate the cremator until the failure has been rectified; and
- If the concerned cremator is in operation when the event of the failure occurs, the operator would immediately shut down the cremator after the outstanding cremation, which is in progress during the failure occurs, has been completed;
- In any case, the operator would not resume the operation of the concerned cremator until the failure has been rectified.

6.3 With respect to the malfunction or breakdown of an air pollution control equipment or a process equipment which results in exceedance of the emission limits, the operator would:

- notify EPD of the following details of the incident by telephone or facsimile to the location designated by the EPD within 2 hours from the incident if the incident occurs between 9:00 a.m. to 5:00 p.m. on a working day, or before 11:00 a.m. on the next working day if the incident occurs at any other time :
  - i. the time when the incident occurred;
  - ii. the equipment concerned;
  - iii. the nature of the malfunction or breakdown;
  - iv. the emission rate and concentration of air pollutant during the incident if known;
  - v. action that had been implemented to stop the abnormal emission.
- submit to EPD the malfunction/breakdown record of the incident within 3 working days from the date of the incident in such a form substantially in accordance with Appendix H.

7. SPILL RESPONSE PLAN

7.1 The following practices would be followed in ensuring suitable handling and spill prevention of chemicals and dangerous goods. Also, the chemical waste should be handled in accordance with the *Waste Disposal (Chemical Waste) (General) Regulation* and the *Packaging, Labelling and Storage of Chemical Waste*.

General Precaution

- Avoid disorder and storage of unnecessary materials in working areas.
- Prevent obstructions and tripping hazards
- Prepare all required equipment prior to commencement of work
- Prohibit smoking at or near the dangerous goods stores
- Treat all chemicals substance with care
- Do not misuse or interfere with safety equipment or appliance provided

Storage Precaution

- Use solid and impermeable enclosure walls or storage containers
- Reduce the danger of falling of stacked containers
- Provide tightly closed lips to avoid leakage of chemical wastes to further reduce the danger of container falling
- Store compatible chemical wastes in the same storage area
- Inspect the storage area to detect if any leakage or defective containers on a regular basis
- Use suitable containers, which are resistant to the stored chemical wastes, to avoid leakage or spillage
- Check the conditions of the storage containers regularly
- Identify and provide suitable notices in storage area
- Provide adequate ventilate in the storage area
- Prohibit open flame and smoking near the chemical waste storage area
- Prevent mixing of incompatible chemical wastes
- Carry Out mixing of compatible chemical wastes outside if the storage area
- Store large and heavy containers on the floor as far as possible or avoid storage of these containers higher than 2 feet from the floor
- Keep chemical waste containers below eye level
- Provide adequate space for handling of the containers
- Maintain a log of chemical wastes
- Separate incompatible chemicals from each other

Transfer and Transport Precaution

- Consider the size of the container to avoid overfilling
- Use pumps to transfer chemical wastes instead of simple pouring
- Provide containment structure to hold the chemical wastes when leakage or spillage of chemical waste occurs
- Use safety and suitable labelled containers
- Use suitable carriers to transfer the chemical waste containers from one location to another

- Employ licensed waste collectors to be responsible for chemical waste transport

Response Actions

- Workers should be aware of emergency telephone numbers, locations of emergency showers, locations of spill kits, emergency exit and evacuation routes. Medical emergency response should be undertaken whenever necessary. The response actions to an accident would include the following steps:
- Report spill to the venue management
- Keep untrained personnel away from the spillage area or evacuate all personnel and call emergency service if the spills are highly toxic and volatile
- Provide forced ventilation in the spillage area
- Allow only trained persons who have equipped with protective clothing and equipment to enter the spillage area for clean up
- Transfer the spills back into containers using suitable equipment whenever practicable
- Use suitable absorbing materials to clean up the spills and dispose the absorbing materials as chemical wastes
- Use suitable solvent to clean the spillage area after removing the spills
- Prepare necessary protective devices, safety equipment, containers and clean up materials for emergency use
- Train staff to handle the spillage of chemicals
- Evaluate the potential hazard of the chemical wastes

Spill Clean Up and Disposal

- Prevent spreading of fumes and vapours by closing doors and windows of spillage area
- Control the leakage of the chemical wastes and absorb the spills using suitable absorbing materials
- Use acidic or alkaline solution for neutralisation wherever appropriate
- Take special precautions for flammable wastes and wastes in powder form
- Keep and label the clean up wastes
- Clean the spillage area and equipment used in the response actions
- Dispose the clean up wastes as chemical wastes

Safety Equipment

- Fire extinguishers
- Brush, dustpan, mop and bucket
- Dry sand
- Tissue and towelling
- Containers including plastic bags, drums, etc
- Absorbing materials
- Pumps
- Sampling devices

8. ENVIRONMENTAL COMPLAINT INVESTIGATION AND HANDLING PROCEDURES

During Construction, Testing and Commissioning of the New Cremators

8.1 Complaints would be referred to the ET for carrying out complaint investigation produces. The ET would undertake the following procedures upon receipt of a complaint:

- Log complaint and date of receipt into the complaint database and inform the IEC immediately;
- Investigate the complaint to determine its validity, an assess whether the source of the problems due to works activities;
- Identify mitigation measures in consultation with the IEC if a complaint is valid and due to works;
- Advise the Contractor if mitigation measures are required;
- Review the Contractor's response to identified mitigation measures, and the updated situation;
- If the complaint is transferred from EPD, submit interim report to the EPD on status of the complaint investigation and follow-up action within the time frame assigned by the EPD;
- Undertake additional monitoring and audit to verify the situation if necessary, and review that circumstances leading to the complaint;
- Report investigation results and subsequent actions to complainant (if the source of complaint is EPD or if the source of complaint is identified through EPD, the results should be reported within the timeframe assigned by the EPD); and
- Record the complaint, investigation, the subsequent actions and the results in the monthly EM&A report.

8.2 During the complaint investigation work, the Contractor should cooperate with the ET in providing all necessary information and assistance for completion of the investigation. If mitigation measures (in consultation with IEC) are required following the investigation, the Contractor should promptly carryout the measures.

8.3 A flow chart of the complaint response procedures during construction and commissioning in shown in Figure 8.1.

During Operation of the New Cremators

8.4 Complaints would be referred to the FEHD (operator) for carrying out complaint investigation during the operation of the new cremators:

- Receipt of written complaint by FEHD;

- Complaint to be date-chopped;
- Head of office assigns a case officer;
- Issue the first interim reply within 3 calendar days (environmental nuisance related) and ten calendar days (non-environmental nuisance related) of receipt of the complaint;
- Case officer investigates complaint (for case involving the referral of the complainant's personal data to other departments, the case officer should obtain the complainant's consent);
- After completion of investigation, the case officer should issue full reply within 21 days of receipt of the complaint to the complainant. If full reply cannot be made within 21 days, the case officer should issue a second interim reply not later than one month from the date of the acknowledgement of receipt. Further interim replies may be issued if considered appropriate.
- For verbal complaints, if a verbal reply is acceptable to the complainant, no follow-up action is required; otherwise, the above complaint investigation procedures should be followed.

9. WASTE MANAGEMENT FOR THE NEW CREMATORIUM OPERATION

9.1 During operation phase of the New Crematorium, the following key types of waste are expected:

- Ash and non-combustible residues generated from cremators during combustion
- Chemical waste generated from the air pollution control system, machinery maintenance and servicing
- General refuse generated by visitors and staff during daily operation

Ash and Non-combustible Residues

9.2 The average weights of bone ash and non-combustible residues after each cremation are about 1.6 kg and 2 kg respectively according to FEHD. Under current practice, bone ash is stored in ash bags with robust inner plastic bags to be collected by the deceased's relatives within 2 months. Based on the analytical results of non-combustible residues (i.e. furnace bottom ash) in Tang Shiu Kin Hospital (TSKH), which contain less than 0.1 ppb TEQ of dioxin, the non-combustible residues would be collected in polyethene bags and disposed of to landfill. Under full load operation and the most updated information from FEHD, each of the 6 cremators can handle 6 cremations per day, therefore the maximum generation of bone ash and non-combustible residues per day are 57.6 kg (1.6 x 6 x 6) and 72 kg (2 x 6 x 6) respectively. Provided that these good practices continue, the potential secondary environmental impacts will be kept to a minimum.

Chemical Wastes

9.3 Chemical wastes, including used furnace coke, un-reacted lime and collected particulate matter would likely be generated by the dry air pollution control system expected to be used at the New Crematorium. The following chemical waste generation rates are used for estimating the amounts of chemical wastes that would be produced by the air pollution control system of the New Crematorium:

- Used furnace coke and un-reacted lime – 0.3 kg per cremation
- Collected particulate matter – 0.95 kg/hr

9.4 Taking 8-hour shift and 6 cremations per cremator per day for the 6 new cremators, it can be calculated that the daily chemical waste arisings associated with operation of the air pollution control system of the New Crematorium would be 10.8 kg (0.3 x 6 x 6) of used furnace coke and un-reacted lime and 45.6 kg (0.95 x 8 x 6) of collected particulate matter. Therefore, the estimated total generation of such chemical wastes would be about 56.4 kg/day.

9.5 In addition, a small amount of chemical waste in form of cleaning fluids, solvents, lubrication oil and fuel will be generated during regular maintenance and servicing of battery fork lift, transformer and switch room, emergency generator room and hydraulic lifts.

9.6 The chemical wastes generated from the air pollution control system would be in form of ash and those generated during maintenance and servicing would mainly be in form of

liquid. Chemical waste may pose serious environmental, health and safety hazards if not stored and disposed of in an appropriate manner as outlined in the *Waste Disposal (Chemical Waste) (General) Regulation* and the *Code of Practice on Packing, Labelling and Storage of Chemical Wastes*. These hazards may include:

- Toxic effects to operators
- Adverse effects on air, water and land from spills
- Fire hazards

9.7 As chemical waste generation is expected, the operator would register with the EPD as chemical waste producer.

9.8 The chemical waste generated from the air pollution control system would mainly include used furnace coke, un-reacted lime and collected particulate matter. To prevent health hazards to operators, all such chemical wastes would be carefully collected and handled to avoid dust emissions.

9.9 All the chemical wastes generated from the air pollution control system as well as from machinery maintenance and servicing should be dealt with according to the *Code of Practice on the Packaging, Labelling and Storage of Chemical Wastes* under the provisions of the *Waste Disposal (Chemical Waste)(General) Regulation*. The chemical wastes would be collected by drum-type containers and removed by licensed waste contractor.

9.10 Location of the chemical store during operation phase is shown in Appendix I.

General Refuse

9.11 According to the experience from operation of the Existing Crematorium, it is anticipated that the quantity of general refuse generated by visitors and staff during daily operation at the New Crematorium will not be substantial. It is expected that the potential environmental impacts arising from the handling and disposal of the general refuse will be negligible, and thus will not cause any major environmental concerns.

9.12 Waste generated in offices should be reduced through segregation and collection of recyclable waste materials (such as paper and carton packages) if the volumes are large enough to warrant collection. Participation in a local collection scheme would be considered if one is available.

9.13 To promote recycling of waste paper, aluminum cans and plastic bottles by the visitors, it is recommended to place clearly labeled recycling bins (such as those available from EPD) at convenient locations within the New Crematorium area. The recyclable waste materials would then be collected by reliable waste recycling agents on a regular basis.

9.14 The general refuse (other than those segregated recyclable wastes) should be separated from any chemical wastes and stored in covered waste containers. Food and Environmental Hygiene Department (FEHD) would remove general refuse from the site, separately from chemical wastes, on daily basis to minimize odour, pest and litter impacts. Burning of refuse must be strictly prohibited.

10. KEY ENVIRONMENTAL ISSUE

10.1 A summary of the key environmental impacts arising from the Project is listed in Table 10.1

Table 10.1 Key Environmental Impacts

Key Environmental Impacts	Commissioning and Operation Phase
Air Quality	RSP, CO, HCl, TOC, SO_2, NO_2, Hg, Dioxins, Excess cancer risk and odour : no predicted exceedance of respective acceptable air quality criteria
Noise	No significant noise impact to nearby NSRs
Land Contamination	Not expected.
Waste Management	Under full load operation and the most updated information from FEHD, each of the 6 cremators can handle 6 cremations per day, therefore the maximum generation of bone ash and non-combustible residues per day are 57.6 kg (1.6 x 6 x 6) and 72 kg (2 x 6 x 6) respectively Chemical Waste dosed chemical 10.8 kg/day for cremation system and particulate matter from cyclone separator and bag filter (45.6 kg/day) With the recommended mitigation measures, environmental impacts anticipated to be not significant.
Landscape and Visual	Landscape: nil Visual: not significant
Water Quality	Anticipated sewage volume is small (28 m^3 per day) and the environmental impact is negligible.
Hazard to Life	3 fuel tanks (with total capacity of 34,000 L) will be installed. With the recommended safety measures, minimal hazard level expected

10.2 A summary of the Implementation schedule for the commissioning and operation of the new cremation are listed in Appendix J.

10.3 In order to avoid or minimize the environmental impacts of the Project, a number of preventive measures which will be implemented during the testing & commissioning stage and operation phase have been recommended in the previous sections and are highlighted below:

- During commissioning of the new cremators, the total number of existing cremators in operation plus new cremators under trial-run must be maintained at no more than six at any time so as to avoid releasing additional air pollutants to the atmosphere.

- In the New Crematorium, the new cremators are equipped with advanced combustion technology with a view to minimizing the amount of air pollutant emissions. Dark smoke and odour emissions should be much improved compared with the existing Crematorium.

- For the whole Project period, all the noisy equipment of the New Crematorium (e.g. condensers of split-type air-conditioning units, radiators for cremators, general exhaust air fans and exhaust fans for the air pollution control system of the cremators) are designed with acoustic control whenever required so as to avoid causing noise nuisances to surrounding sensitive receivers.

- Adoption of air pollution control technology based on 'dry process' significantly reduces

wastewater production.

- Adequate safety design features are incorporated and provided with proper safety / precautionary measures for 3 fuel tanks of the New Crematorium to minimize the hazard level and to prevent fuel spillage/leakage.

11. ODOUR PATROL REQUIREMENT

Background

11.1 With the adoption of advanced incineration technology and installation of effective air pollution control system, it is anticipated that emission of air pollutants from the new cremators would be reduced to an acceptable limit. Referring to the air quality impact assessment as discussed in *Section 4* of the Environmental Impact Assessment, the maximum 5 second average odour exposure at all the ASRs are well below the acceptable criterion as specified in the *Annex 4* of the *EIOA TM* and so there is no significant odour impact to the ASRs.

11.2 In order to prevent odour impact to the near ASRs, odour patrol would be carried out twice per year during the operation of the Diamond Hill Crematorium by operator. Maintenance for cremation system (Appendix F), Action and Limit Levels (Table11.1) and Event Action Plan (Appendix K) would be carried out according to if there would be any potential for odour nuisance.

Methodology

11.3 Patrol trip would be carried out according to the schedule of the crematorium in order to patrol the worse case scenario.

11.4 Patrol route would pass all the facilities as well as the identified ASRs and boundary of the Diamond Hill Crematorium. The patrol members would patrol slowly along the routes and record all the findings in their logbooks.

11.5 The meteorological data including temperature, wind direction, wind speed, relative humidity, air pressure from Hong Kong Observatory should obtain for record.

11.6 The odour intensity should determined at 5 different levels from 0 to 4 as below:

0	Not detectable	No odour perceived or an odour so weak that cannot be easily detect
1	Slight	Identifiable odour, slight
2	Moderate	Identifiable odour, moderate
3	Strong	Identifiable odour, strong
4	Extreme	Severe odour

Odour Complaint

11.7 When a complaint is received regarding odour nuisance, the operator would review the odour compliance register against the Acton and Limit Levels for odour monitoring as shown in Table 11.1 and action in accordance with the Event Action Plan shown in Appendix K. When a complaint is received during the Operation Phase, operator should carry out complaint investigation according to section 8.4.

Table 11.1 Action and Limit Levels for Odour Monitoring

Parameter	Action Level	Limit Level
Perceived odour intensity	Higher than or Equal to Level 2	Level 4
Incidence of odour complaints	Any incidence of odour complaint received	Two or more odour complaints received within one month

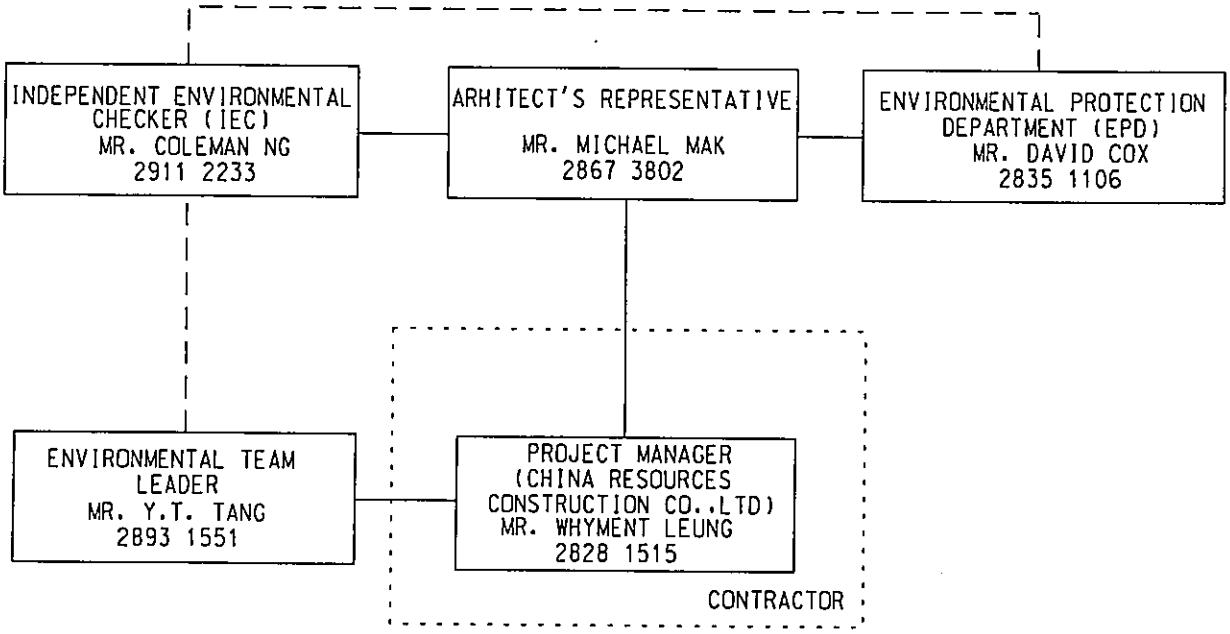
11.8 This mitigation measures can ensure the surrounding environment will not be affected to unforeseen odour nuisance and no residual impacts occur after the commissioning of the Project.

12. ENVIRONMENTAL MONITORING DATA AND RESULTS DURING OPERATION OF THE NEW CREMATORIUM

12.1 The operator would ensure a high degree of transparency regarding the performance of the new crematorium in view of the public concern about the Project during the operation of the new crematorium.

12.2 In accordance with Condition 6.5 of the Environmental Permit EP-179/2004/B, the operator should conduct environmental monitoring during operation of the new crematorium according to the approved EIA report and any enhanced monitoring works considered applicable under other relevant environmental protection and pollution control ordinances.

FIGURE



LEGEND:

——— DIRECT COMMUNICATION

– – – LIAISON

MAUNSELL | AECOM Maunsell Environmental Management Consultants Ltd	CONTRACT NO: SS M333 - REPROVISIONING OF DIAMOND HILL CREMATORIUM PROJECT ORGANIZATION FOR ENVIRONMENTAL MANAGEMENT (DURING CONSTRUCTION, TESTING AND COMMISSIONING)	SCALE: N.T.S. / DATE: 2006 CHECK: FSYY / DRAWN: LLMC JOB No.: S07904	DRAWING No.: 2.1 / REV: –

K:/S07904/DRAWING/REPORTS/200609/ORGAN-ENV.DGN

Organization Chart for Operational Phases in new Diamond Hill Crematorium

FEHD Venue Manager

Administer & supervise the overall daily operation

EMSD Team

- Provide resident operational services for cremation equipment;
- Provide chemical handling, storage and filling services by EMSD's chemical waste specialized contractor;
- Provide non-resident maintenance services for all engineering equipment.

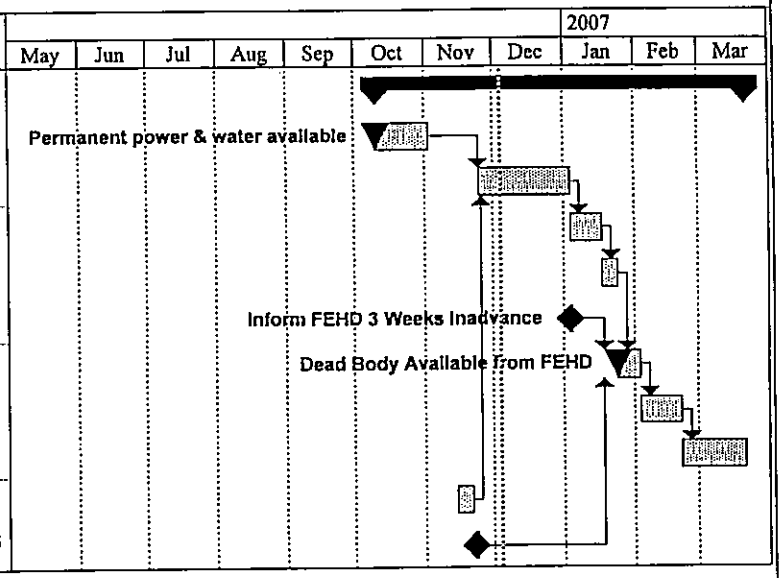
FEHD Team

- Check relevant documents to ensure that only right bodies are cremated;
- Monitor the use and cleanliness of service halls;
- Provide coffin reception, transportation and handling services;
- Provide bone pulverization services; and
- Maintain and control the daily operation of the Crematorium and Columbarium.

Southa Technical Ltd
Replacement of Cremators at Diamond Hill Crematorium
Testing & Commissioning Programme

B30/CR/P/T&C/01 Rev : C

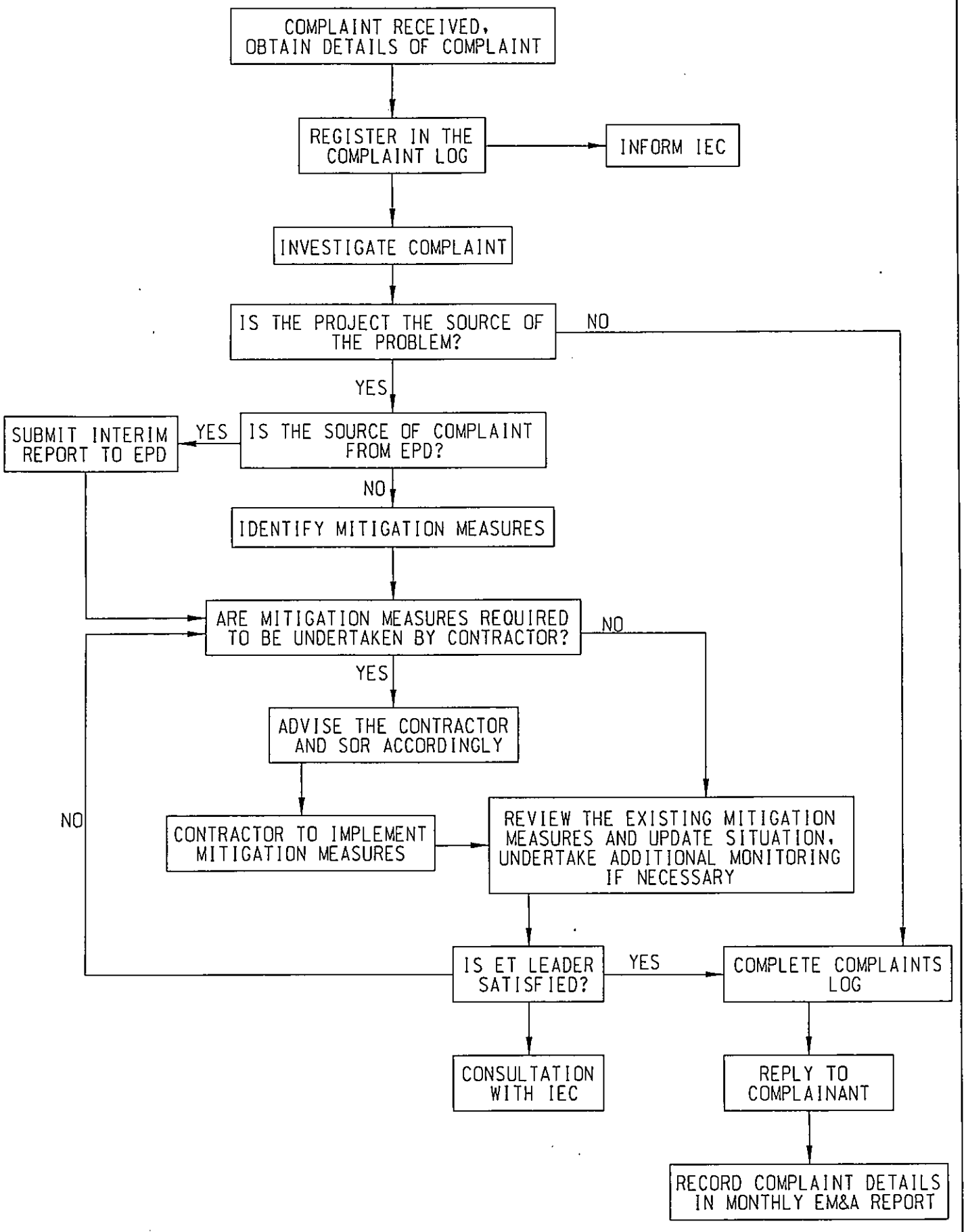
ID	Task Name	Duration	Start	Finish
1	**Testing & Commissioning**	**162 days**	**Wed 06/10/11**	**Wed 07/3/21**
2	Equipment Functional Test	23 days	Wed 06/10/11	Thu 06/11/2
3	Dry Heating	40 days	Sat 06/11/25	Wed 07/1/3
4	Cold Commissioning	14 days	Thu 07/1/4	Wed 07/1/17
5	Pre-heating	7 days	Thu 07/1/18	Wed 07/1/24
6	Inform FEHD, Only 3 Old Cremators Can Be Operated	1 day	Thu 07/1/4	Thu 07/1/4
7	Trail Run	10 days	Thu 07/1/25	Sat 07/2/3
8	Emission Test Manual Sampling	18 days	Sun 07/2/4	Wed 07/2/21
9	Emission Test Report Issuance	28 days	Thu 07/2/22	Wed 07/3/21
10	DG Licence Issued By FSD	7 days	Wed 06/11/15	Tue 06/11/21
11	SP Licence Issued By EPD	1 day	Thu 06/11/23	Thu 06/11/23



Project: DHC Section 1 T&C

Task
Split
Progress
Milestone
Summary
Rolled Up Task
Rolled Up Split
Rolled Up Milestone ◇
Rolled Up Progress
External Tasks
Project Summary

Remark :
1. EIA specific max. 6 cremators can be operated simultaneously including existing old cremators (3 new + 3 old) .



MAUNSELL | AECOM

Maunsell Environmental Management Consultants Ltd

CONTRACT NO: SS M333 - REPROVISIONING OF DIAMOND HILL CREMATORIUM

COMPLAINT FLOW DIAGRAM

(DURING CONSTRUCTION, TESTING AND COMMISSIONING)

SCALE	N.T.S.	DATE	2006
CHECK	FSYY	DRAWN	LLMC
JOB No.	S07904	DRAWING No.	8.1
		REV	-

K:/S07904/DRAWING/REPORTS/200609/FLOW_DIAGRAM.DGN

APPENDIX A
Key Contacts of Environmental Personnel

Appendix A Key Contacts of Environmental Personnel
(Construction, Commissioning, Operation Phases)

Key Contacts during Construction and Commissioning Phase

Party	Name	Telephone No.	Fax No.
Environmental Protection Department			
SEPO	Mr. David Cox	2835 1106	2591 0558
EPO	Ms. Marlene Ho	2835 1186	2591 0558
EPO (ECD)	Mr. Charles Wu	2117 7540	2756 8588
Architect Representative			
Architectural Services Department			
Project Architect	Mr. Michael Mak	2867 3802	2524 8194
Project E&M Engineer	Mr. Thomas Cheung	2867 4162	2868 4562
Independent Environmental Checker			
Hyder Consulting Limited			
IEC	Mr. Coleman Ng	2911 2233	2805 5028
Assistant to IEC	Mr. Adi Lee	2911 2233	2805 5028
Contractor			
China Resources Construction Company Limited			
Project Manager	Mr. Whyment Leung	2828 1515	2827 2921
Environmental Team			
Maunsell Environmental Management Consultants Limited			
ET Leader	Mr. Y.T. Tang	2893 1551	2891 0305
Audit Team Leader	Mr. Kenneth Lau	2893 1551	2891 0305
Monitoring Team Leader	Mr. Eddie Yang	2893 1551	2891 0305

Key Contacts during Operation Phase

Party	Name	Telephone No.	Fax No.
Food and Environmental Hygiene Department			
FEHD	Mr. Chung Ho Chau	2364 5405	2176 4963
	Mr. Yeung Chun Hoi	2867 5637	2521 7261
Electrical and Mechanical Services Department			
EMSD	Mr. Jeff Tse	3155 4071	2895 1424
	Mr. Peter Chau	3155 4100	2304 2075

APPENDIX B
Emission Limit of Air Monitoring

Appendix B Emission Limit of Air Monitoring

Emission Point	Equipment Served by the Emission Point	Air Pollutant	Concentration of the Air Pollutant in the Exhaust Gas not to be exceeded (mg/m^3)(a)	Emission Rate not to be exceeded (kg/hr)	Emission Target Level not to be exceeded (mg/m3)(a,b)
EP1,EP3, EP5,EP6	Cremators numbered 1,3,5,6	Particulates	100(c)	0.1798	40(c)
		Hydrogen chloride (HCl)	100(c)	0.1798	30(c)
		Carbon Monoxide(CO)	100(c)	0.1798	n/a
		Nitrogen oxides (expressed as nitrogen dioxide)	380(c)	0.1367	n/a
		Gaseous and vaporous organic substances, expressed as total organic carbon	20(c)	0.036	n/a
		Dioxins (Polychlorinated dibenzodioxins and polychlorinated dibenzofurans)	1 ng I-TEQ /m^3	$1.8x10^{-9}$	0.1 ng I-TEQ /m^3
		Mercury and its compounds, expressed as Mercury(Hg)	0.2(c)	0.00036	0.05(c)
EP2,EP4	Cremators nembered 2,4	Particulates	100(c)	0.2318	40(c)
		Hydrogen chloride (HCl)	100(c)	0.2318	30(c)
		Carbon Monoxide(CO)	100(c)	0.2318	n/a
		Nitrogen oxides (expressed as nitrogen dioxide)	380(c)	0.1762	n/a
		Gaseous and vaporous organic substances, expressed as total organic carbon	20(c)	0.04637	n/a
		Dioxins (Polychlorinated dibenzodioxins and polychlorinated dibenzofurans)	1 ng I-TEQ /m^3	$2.3x10^{-9}$	0.1 ng I-TEQ /m^3
		Mercury and its compounds, expressed as Mercury(Hg)	0.2(c)	0.0004636	0.05(c)
DG1	Emergency Generator	Sulphur dioxide	385.8(c)	n/a	n/a
		Nitrogen oxides (expressed as nitrogen dioxide)	5020(c)	n/a	n/a

(a)Expressed as at dry, 0 degree Celsius temperature, 101.325 kilopascal pressure, 11% oxygen concentration conditions.

(b)An emission target level will be in force if the results of the source sampling of the first eighteen months after the completion of commissioning of the cremators show that the cremators can meet the concerned smission target level.

(c)one-hour average value

APPENDIX C
Particular of Emission Points

Appendix C Particulars of Emission Points

Emission Point	Equipment Served by the Emission Point	Chimmey Height (metre above ground)	Chimney Exit Diameter (m)	Minimum Exit Temperature (degree Celsius)
EP1	Cremator Numbered 1	30.2	0.24	100
EP2	Cremator Numbered 2	30.2	0.27	100
EP3	Cremator Numbered 3	30.2	0.24	100
EP4	Cremator Numbered 4	30.2	0.27	100
EP5	Cremator Numbered 5	30.2	0.24	100
EP6	Cremator Numbered 6	30.2	0.24	100
DG1	Emergency Generator	8.55	0.3	100

APPENDIX D
Frequency of Air Monitoring

Appendix D Frequency of Air Sampling

Air Pollutant	Sampling frequency for each cremator	Number of sample required
Particulates Dioxins Mercury and its compounds, expressed as mercury Nitrogen oxides (expressed as nitrogen dioxide)	i, Subject to ii, below, the sampling frequency is once per every three months. ii, The sampling frequency can be changed to once per every calendar year for particulates, nitrogen oxides and mercury and its compounds, and to once per every six months for dioxins, subject to satisfactory demonstration of compliance in emissions for air pollutants with a full set of four consecutive measurements in twelve months after the completion of fine tuning of cremators.	Two gas samples for each parameter for each cremator
Hydrogen chloride Carbon monoxide Gaseous and vaporous organic substances, expressed as total organic carbon)	Once per every calendar year	

APPENDIX E
Test Method for Air Monitoring

Appendix E Test Method for Air Monitoring

Parameter	Test Method
Particulates	USEPA Method 5
Hydrogen Chloride	USEPA Method 26A
Carbon Monoxide	USEPA Method 10
Nitrogen Dioxide	USEPA Method 7C or USEPA Method 7E
Gaseous and vaporous organic substances, expressed as total organic carbon	USEPA Method 25A or USEPA Method 18
Dioxins	USEPA Method 23
Mercury and its compounds, expressed as mercury	USEPA Method 29 or USEPA Method 101A

APPENDIX F
Maintenance Procedures for New Cremators

MAINTENANCE PROCEDURE

The preventive maintenance programme and check sheet of the cremation system is listed below:

Instructions for maintenance and lubrication cremator

1) Cremator – brickwork
2) Cremator door with drive
3) Flue gas channel – brickwork
4) Flue gas gate – bypass
5) Flue gas gate – main channel
6) Cremulator
7) Rotary valve – main burning chamber
8) Rotary valve – mineralizaton
9) Rotary valve – drive – mineralization
10) Butterfly valves with actuator – top air
11) Butterfly valves with actuator – side air (right)
12) Butterfly valves with actuator – side air (left)
13) Butterfly valve with actuator – buttom air
14) Butterfly valve with actuator – secondary combustion zone 1
15) Butterfly valve with actuator – secondary combustion zone 2
16) Butterfly valve with actuator – secondary combustion protection air left
17) Butterfly valve with actuator – secondary combustion protection air right
18) Butterfly valve with actuator – door vacuum cleaning system
19) Butterfly valve cooling air
20) Safety cooling air flap – before filter
21) Burner – main chamber
22) Burner mineralization

23) Burner – secondary combustion
24) Diesel fuel pipes leading to the burners, with shut off fitting
25) Heat exchanger – flue gas cooler
26) Remote radiator
27) Flue gas cleaning – additive dosing device
28) Flue gas cleaning – ball rotor
29) Flue gas cleaning – screw conveyor
30) Flue gas cleaning – bag filter
31) Flue gas fan
32) Cooling air fan
33) Combustion air fan
34) Pneumatic ducts
35) Cremain treatment system for line 1 to 4
36) Thermocouple – main burning chamber
37) Thermocouple – secondary combustion
38) Thermocouple – mineralization
39) Thermocouple – before economiser
40) Covered thermocouple – after economiser 2
41) Thermocouple – before filter
42) Thermocouple – reference CO measurement
43) Thermocouple – combustion air pipe warm
44) Thermocouple – bypass channel
45) Thermocouple – before air preheater – MP2
46) Thermocouple – after air preheater before economiser 2 – MP3
47) Pressure monitor / Differential pressure measurement transducer
48) Oxygen measurement behind cremator
49) Oxygen measurement emission
50) Measurement instrument for CO – concentration (raw gas)

51) Measurement instrument for CO – concentration (clean gas suction side)
52) Gas analysis MCS 100
53) Dust measurement

10.2. Checklist Maintenance for Cremator

Instructions for maintenance and lubrication Cremator ( )

Cremator - brickwork

Works to be carried out	Inspection					Maintenance					Notes	
	D	W	M	1/2Y	Y	D	W	M	1/2Y	Y		
Check for wear and tear				O					I	I		
Cleaning of accessible cremator drafts and – channels (side pockets)		O							I	I	once a week; but at the latest after 50 cremations	

O ... Operator
I ... IFZW / Southa

Spare parts consumption:

Notes:

.....	.....	.....
Executing company Date, Place, Signature	Head of crematorium Date, place, signature	Head of Department Date, place, signature

Instructions for maintenance and lubrication Cremator ( )

Flue gas channel - brickWorks

Works to be carried out	Inspection					Maintenance					Notes	
	D	W	M	1/2Y	Y	D	W	M	1/2Y	Y		
Check for wear and tear – BrickWorks									I	I		
Check for closeness									I	I		
Change sealing cords									I	I		
Clean complete channel			O						I	I	especially bottom slots of flue gas channel gates	
Check manholes for closeness									I	I		

O ... Operator
I ... IFZW / Southa

Spare parts consumption:

Notes:

.....	.....	.....
Executing company Date, place, signature	Head of Crematorium Date, place, signature	Head of Department Date, place, signature

Instructions for maintenance and lubrication Cremator ( )

Cremator door with drive (H2)

Wiring diagram no.:

Works to be carried out	Inspection					Maintenance					Lubricants	Quantity
	D	W	M	1/2Y	Y	D	W	M	1/2Y	Y		
Check for wear and tear - brickwork									I	I		
Check for closeness			O						I	I		
Change sealing cords									I	I		
Adjust cremator door									I	I		
Adjust pressing device									I	I		
Drive												
Check chain tension									I	I		
re-grease chain and chain wheels									I	I		
Check micro-limit switch									I	I		
Check motor fixation and tighten if necessary									I	I		

O ... Operator
I ... IFZW / Southa

Spare parts consumption:

Notes:

.....	.....	.....
Executing company Date, Place, Signature	Head of crematorium Date, place, signature	Head of Department Date, place, signature

Southa Technical Ltd
7/F Paramount Building, 12 Ka Yip Street, Chai Wan HK
Tel 29637122 Fax: 29637101, Web : www.southa.com

Instructions for maintenance and lubrication Cremator ( )

Flue gas gate – bypass

Works to be carried out	Inspection					Maintenance					Notes	
	D	W	M	1/2Y	Y	D	W	M	1/2Y	Y		
Check for function	O								I	I		
Check for wear and tear									I	I		
Check gate plate for closeness									I	I		
Function limit switch – Check pneumatic cylinder (open – close)		O							I	I		
Grease piston rod pneumatic cylinder									I	I		
Check safety limit switch for function (open)	O								I	I		
Check pneumatic connections for closeness	O								I	I		
Check solenoid valves									I	I		
Clean maintenance unit			O						I	I		

O ... Operator
I ... IFZW / Southa

spare parts consumption:

Notes:

.....	.....	.....
Executing company Date, Place, Signature	Head of crematorium Date, place, signature	Head of Department Date, place, signature

Southa Technical Ltd
7/F Paramount Building, 12 Ka Yip Street, Chai Wan HK
Tel 29637122 Fax: 29637101, Web : www.southa.com

Instructions for maintenance and lubrication Cremator ( )

Flue gas gate – main channel

Works to be carried out	Inspection					Maintenance					Notes	
	D	W	M	1/2Y	Y	D	W	M	1/2Y	Y		
Check for function	O								I	I		
Check for wear and tear									I	I		
Check gate plate for tightness									I	I		
Check function limit switch – Check pneumatic cylinder (open – close)		O							I	I		
Grease piston rod pneumatic cylinder									I	I		
Check safety limit switch for function (open)	O								I	I		
Check pneumatic connections for closeness	O								I	I		
Check solenoid valves									I	I		
Clean maintenance unit			O						I	I		

O ... Operator
I ... IFZW / Southa

Spare parts consumption:

Notes:

.....	.....	.....
Executing company Date, Place, Signature	Head of crematorium Date, place, signature	Head of Department Date, place, signature

Instructions for maintenance and lubrication Cremator ( )

Cremulator

Works to be carried out	Inspection					Maintenance					Notes	
	D	W	M	1/2Y	Y	D	W	M	1/2Y	Y		
Check for function	O								I	I		
Check for closeness		O							I	I		
Change sealing cords										I		

O ... Operator
I ... IFZW / Southa

Spare parts consumption

Notes:

.....	.....	.....
Executing company Date, Place, Signature	Head of crematorium Date, place, signature	Head of Department Date, place, signature

Southa Technical Ltd
7/F Paramount Building, 12 Ka Yip Street, Chai Wan HK
Tel 29637122 Fax: 29637101, Web : www.southa.com

Instructions for maintenance and lubrication Cremator ( )

Rotary valves – main burning chamber

Works to be carried out	Inspection					Maintenance					Notes	
	D	W	M	1/2Y	Y	D	W	M	1/2Y	Y		
Check for function	B								I	I		
Check for wear and tear									I	I		
Rotation of rotary valve by 180°									I	I		
Check bearings for wear and tear									I	I		
Check shaft for wear and tear									I	I		

O ... Operator
I ... IFZW / Southa

Spare parts consumption:

Notes:

..... Executing company
Date, Place, Signature

..... Head of crematorium
Date, place, signature

..... Head of Department
Date, place, signature

Instructions for maintenance and lubrication Cremator ( )

Rotary valves – drive – main burning chamber

wiring diagram no.:

Works to be carried out	Inspection					Maintenance					Notes	
	D	W	M	1/2Y	Y	D	W	M	1/2Y	Y		
Check for function	O								I	I		
Check for wear and tear									I	I		
Check pneumatic connections for closeness	O								I	I		
Check function of limit switch		O							I	I		
Check solenoid valves									I	I		
Clean maintenance unit			O						I	I		

O ... Operator
I ... IFZW / Southa

Spare parts consumption:

Notes:

.....	.....	.....
Executing company Date, Place, Signature	Head of crematorium Date, place, signature	Head of Department Date, place, signature

Southa Technical Ltd
7/F Paramount Building, 12 Kn Yip Street, Chai Wan HK
Tel 29637122 Fax: 29637101, Web : www.southa.com

Instructions for maintenance and lubrication Cremator ( )

Rotary valves - mineralisation

Works to be carried out	Inspection					Maintenance					Notes	
	D	W	M	1/2Y	Y	D	W	M	1/2Y	Y		
Check for function	O								I	I		
Check for wear and tear									I	I		
Rotating of rotary valves by 180°									I	I		
Check bearing for wear and tear									I	I		
Check shaft for wear and tear									I	I		

O ... Operator
I ... IFZW / Southa

Spare parts consumption:

Notes:

.....	.....	.....
Executing company Date, Place, Signature	Head of crematorium Date, place, signature	Head of Department Date, place, signature

Instructions for maintenance and lubrication Cremator ( )

Butterfly valves with actuator – top air wiring diagram no.:

Works to be carried out	Inspection					Maintenance					Notes	
	D	W	M	1/2Y	Y	D	W	M	1/2Y	Y		
Check for function	O								I	I	plausibility	
Check for wear and tear									I	I		
Check function of limit switch (open – close)		O							I	I		

O ... Operator
I ... IFZW / Southa

Spare parts consumption:

Notes:

....
Executing company
Date, Place, Signature

....
Head of crematorium
Date, place, signature

....
Head of Department
Date, place, signature

Southa Technical Ltd
7/F Paramount Building, 12 Ka Yip Street, Chai Wan HK
Tel 29637122 Fax: 29637101, Web : www.southa.com

Instructions for maintenance and lubrication Cremator ( )

Rotary valves – drive – mineralisation **wiring diagram no.:**

Works to be carried out	Inspection					Maintenance					Notes	
	D	W	M	1/2Y	Y	D	W	M	1/2Y	Y		
Check for function	O								I	I		
Check for wear and tear									I	I		
Check pneumatic connections for closeness	O								I	I		
Check function of limit switch		O							I	I		
Check solenoid valves									I	I		
clean maintenance unit			O						I	I		

O ... Operator
I ... IFZW / Southa

Spare parts consumption:

Notes:

.....	.....	.....
Executing company Date, Place, Signature	Head of crematorium Date, place, signature	Head of Department Date, place, signature

Instructions for maintenance and lubrication Cremator ( )

Butterfly valve with actuator – side air (right) wiring diagram no.:

Works to be carried out	Inspection					Maintenance					Notes	
	D	W	M	1/2Y	Y	D	W	M	1/2Y	Y		
Check for function	O								I	I	plausibility	
Check for wear and tear									I	I		
Check function of limit switch (open – close)		O							I	I		

O ... Operator
I ... IFZW / Southa

Spare parts consumption:

Notes:

..... Executing company
Date, Place, Signature

..... Head of crematorium
Date, place, signature

..... Head of Department
Date, place, signature

Instructions for maintenance and lubrication Cremator ( )

Butterfly valve with actuator – side air (left)

wiring diagram no.:

Works to be carried out	Inspection					Maintenance					Notes	
	D	W	M	1/2Y	Y	D	W	M	1/2Y	Y		
Check for function	O								I	I	plausibility	
Check for wear and tear									I	I		
Check function of limit switch (open – close)		O							I	I		

O ... Operator
I ... IFZW / Southa

Spare parts consumption:

Notes:

.....	.....	.....
Executing company Date, Place, Signature	Head of crematorium Date, place, signature	Head of Department Date, place, signature

Southa Technical Ltd
7/F Paramount Building, 12 Ka Yip Street, Chai Wan HK
Tel 29637122 Fax: 29637101, Web : www.southa.com

Instructions for maintenance and lubrication Cremator ( )

Butterfly valves with actuator – bottom air

wiring diagram no.:

Works to be carried out	Inspection					Maintenance					Notes	
	D	W	M	1/2Y	Y	D	W	M	1/2Y	Y		
Check for function	O								I	I		
Check for wear and tear									I	I		
Check function of limit switch (open – close)		O							I	I		

O ... Operator
I ... IFZW / Southa

Spare parts consumption:

Notes:

....
Executing company
Date, Place, Signature

....
Head of crematorium
Date, place, signature

....
Head of Department
Date, place, signature

Instructions for maintenance and lubrication Cremator ( )

Butterfly valves with actuator – secondary combustion zone 1 wiring diagram no.:

Works to be carried out	Inspection					Maintenance					Notes	
	D	W	M	1/2Y	Y	D	W	M	1/2Y	Y		
Check for function	O								I	I	Plausibility	
Check for wear and tear									I	I		
Check function limit switch (open – close)		O							I	I		

O ... Operator
I ... IFZW / Southa

Spare parts consumption:

Notes:

.....	.....	.....
Executing company Date, Place, Signature	Head of crematorium Date, place, signature	Head of Department Date, place, signature

Southa Technical Ltd
7/F Paramount Building, 12 Ka Yip Street, Chai Wan HK
Tel 29637122 Fax: 29637101, Web : www.southa.com

Instructions for maintenance and lubrication Cremator ( )

Butterfly valves with actuator – secondary combustion zone 2 **wiring diagram no.:**

Works to be carried out	Inspection					Maintenance					Notes	
	D	W	M	1/2Y	Y	D	W	M	1/2Y	Y		
Check for function	O								I	I		
Check for wear and tear									I	I		
Check function limit switch (open – close)		O							I	I		

O ... Operator
I ... IFZW / Southa

Spare parts consumption:

Notes:

.....	.....	.....
Executing company	Head of crematorium	Head of Department
Date, Place, Signature	Date, place, signature	Date, place, signature

Instructions for maintenance and lubrication Cremator ( )

Butterfly valves with actuator – secondary combustion zone 2 wiring diagram no.:

Works to be carried out	Inspection					Maintenance					Notes	
	D	W	M	1/2Y	Y	D	W	M	1/2Y	Y		
Check for function	O								I	I		
Check for wear and tear									I	I		
Check function limit switch (open – close)		O							I	I		

O ... Operator
I ... IFZW / Southa

Spare parts consumption:

Notes:

.....	.....	.....
Executing company Date, Place, Signature	Head of crematorium Date, place, signature	Head of Department Date, place, signature

Southa Technical Ltd
7/F Paramount Building, 12 Ka Yip Street, Chai Wan HK
Tel 29637122 Fax: 29637101, Web : www.southa.com

Instructions for maintenance and lubrication Cremator ( )

Butterfly valve with acutator – secondary combustion protection air left

wiring diagram no.:

Works to be carried out	Inspection					Maintenance					Notes	
	D	W	M	1/2Y	Y	D	W	M	1/2Y	Y		
Check for function	O								I	I		
Check for wear and tear									I	I		
Check function of limit switch (open – close)		O							I	I		

O ... Operator
I ... IFZW / Southa

Spare parts consumption:

Notes:

..... Executing company
Date, Place, Signature

..... Head of crematorium
Date, place, signature

..... Head of Department
Date, place, signature

Instructions for maintenance and lubrication Cremator ( )

Butterfly valves with actuator – secondary combustion protection air right wiring diagram no.:

Works to be carried out	Inspection					Maintenance					Notes	
	D	W	M	1/2Y	Y	D	W	M	1/2Y	Y		
Check for function	O								I	I		
Check for wear and tear									I	I		
Check function of limit switch (open – close)		O							I	I		

O ... Operator
I ... IFZW / Southa

Spare parts consumption:

Notes:

..... Executing company
Date, Place, Signature

..... Head of crematorium
Date, place, signature

..... Head of Department
Date, place, signature

Instructions for maintenance and lubrication Cremator ( )

Butterfly valves with actuator – door vacuum cleaning system wiring diagram no.:

Works to be carried out	Inspection					Maintenance					Notes	
	D	W	M	1/2Y	Y	D	W	M	1/2Y	Y		
Check for function	B								I	I		
Check for wear and tear									I	I		
Check function of limit switch (open – close)		B							I	I		

O ... Operator
I ... IFZW / Southa

Spare parts consumption:

Notes:

..... Executing company
Date, Place, Signature

..... Head of crematorium
Date, place, signature

..... Head of Department
Date, place, signature

Instructions for maintenance and lubrication Cremator ( )

Butterfly valves cooling air

wiring diagram no.:

Works to be carried out	Inspection					Maintenance					Notes	
	D	W	M	1/2Y	Y	D	W	M	1/2Y	Y		
Check for function			O						I	I		
Check for wear and tear									I	I		

O ... Operator
I ... IFZW / Southa

Spare parts consumption:

Notes:

..... Executing company
Date, Place, Signature

..... Head of crematorium
Date, place, signature

..... Head of Department
Date, place, signature

Instructions for maintenance and lubrication Cremator ( )

Safety cooling air flap – before filter

wiring diagram no.:

Works to be carried out	Inspection					maintenance					Notes	
	D	W	M	1/2Y	Y	D	W	M	1/2Y	Y		
Check function	O								I	I		
Check for wear and tear									I	I		
Check function of limit switch (open – close)		O							I	I		

O ... Operator
I ... IFZW / Southa

Spare parts consumption:

Notes:

.....	.....	.....
Executing company Date, Place, Signature	Head of crematorium Date, place, signature	Head of Department Date, place, signature

Southa Technical Ltd
7/F Paramount Building, 12 Ka Yip Street, Chai Wan HK
Tel 29637122 Fax: 29637101, Web : www.southa.com

Instructions for maintenance and lubrication Cremator ( )

Burner – main chamber

Wiring diagram no.:

Works to be carried out	Inspection					Maintenance					Notes	
	D	W	M	1/2Y	Y	D	W	M	1/2Y	Y		
Check for function	O								I	I		
Complete Check by IFZW or local customer service									I	I		

O ... Operator
I ... IFZW / Southa

In addition, the manufacturer's specific instructions for maintenance must be followed!

Spare parts consumption:

Notes:

.....	.....	.....
Executing company	Head of crematorium	Head of Department
Date, Place, Signature	Date, place, signature	Date, place, signature

Instructions for maintenance and lubrication Cremator ( )

Burner – mineralisation

Wiring diagram no.:

Works to be carried out	Inspection					Maintenance					Notes	
	D	W	M	1/2Y	Y	D	W	M	1/2Y	Y		
Check for function	O								I	I	plausibility	
Complete Check by IFZW or local customer service									I	I		

O ... Operator
I ... IFZW / Southa

In addition, the manufacturer's specific instructions for maintenance must be followed!

Spare parts consumption:

Notes:

.....	.....	.....
Executing company Date, Place, Signature	Head of crematorium Date, place, signature	Head of Department Date, place, signature

Instructions for maintenance and lubrication Cremator ( )

Burner – Secondary combustion

Wiring diagram no.:

Works to be carried out	Inspection					Maintenance					Notes	
	D	W	M	1/2Y	Y	D	W	M	1/2Y	Y		
Check for function	O								I	I	plausibility	
Complete Check by IFZW or local customer service									I	I		

O ... Operator
I ... IFZW / Southa

In addition, the manufacturer's specific instructions for maintenance must be followed!

Spare parts consumption:

Notes:

.....	.....	.....
Executing company Date, Place, Signature	Head of crematorium Date, place, signature	Head of Department Date, place, signature

Southa Technical Ltd
7/F Paramount Building, 12 Ka Yip Street, Chai Wan HK
Tel 29637122 Fax: 29637101, Web : www.southa.com

Instructions for maintenance and lubrication Cremator ( )

Diesel fuel pipes leading to the burners, with shut-off fittings

Works to be carried out	Inspection					Maintenance					Notes	
	D	W	M	1/2Y	Y	D	W	M	1/2Y	Y		
Check for closeness		O							I	I		

O ... Operator
I ... IFZW / Southa

Spare parts consumption:

Notes:

..... Executing company
Date, Place, Signature

..... Head of crematorium
Date, place, signature

..... Head of Department
Date, place, signature

Instructions for maintenance and lubrication Cremator ( )

Heat exchanger – flue gas cooler

Works to be carried out	Inspection					maintenance					Notes	
	D	W	M	1/2Y	Y	D	W	M	1/2Y	Y		
Check for soiling of heating areas			O*						I	I	every 250 cremations*	
Clean heating areas			O*						I	I	every 250 cremations*	
Clean adjoining flue gas channel									I	I		

* depends which occurs first

O ... Operator
I ... IFZW / Southa

Spare parts consumption:

Notes:

.....	.....	.....
Executing company Date, Place, Signature	Head of crematorium Date, place, signature	Head of Department Date, place, signature

Instructions for maintenance and lubrication Cremator ( )

Remote radiator

wiring diagram no.:

Works to be carried out	Inspection					Maintenance					Lubricants	Quantity
	D	W	M	1/2Y	Y	D	W	M	1/2Y	Y		
Axial fans												
Check for balance errors - loud running noises	O								I	I		
Check bearings for wear and tear			O						I	I		
Motor												
Check drawing of current of phases									I	I		
Re-grease motor									I	I		

O ... Operator
I ... IFZW / Southa

Spare parts consumption:

Notes:

.....	.....	.....
Executing company Date, Place, Signature	Head of crematorium Date, place, signature	Head of Department Date, place, signature

Instructions for maintenance and lubrication Cremator ( )

Flue gas cleaning – additive dosing device

Works to be carried out	Inspection/measure					maintenance					Notes	
	D	W	M	1/2Y	Y	D	W	M	1/2Y	Y		
Check for function	O								I	I		
Check level of dosing container, fill up if required		O							I	I		
Charge storage battery of scale											as required (O)	

O ... Operator
I ... IFZW / Southa

In addition, the manufacturer's specific instructions for maintenance must be followed!

Spare parts consumption

Notes:

.....	.....	.....
Executing company Date, Place, Signature	Head of crematorium Date, place, signature	Head of Department Date, place, signature

Instructions for maintenance and lubrication Cremator ( )

Flue gas cleaning – ball rotor

Works to be carried out	Inspection					maintenance					Notes	
	D	W	M	1/2Y	Y	D	W	M	1/2Y	Y		
Check for function		O							I	I		
Check for loud running noises	O								I	I		
Check drive motor	O											
Check roller bearing										I		
Check lubrication of bearing, renew if necessary			O						I	I		

O ... Operator
I ... IFZW / Southa

In addition, the manufacturer's specific instructions for maintenance must be followed!

Spare parts consumption:

Notes:

.....	.....	.....
Executing company Date, Place, Signature	Head of crematorium Date, place, signature	Head of Department Date, place, signature

Southa Technical Ltd
7/F Paramount Building, 12 Ka Yip Street, Chai Wan HK
Tel 29637122 Fax: 29637101, Web : www.southa.com

Instructions for maintenance and lubrication Cremator ( )

Flue gas cleaning – screw conveyor

Works to be carried out	Inspection					Maintenance					Notes	
	D	W	M	1/2Y	Y	D	W	M	1/2Y	Y		
Check for function	O								I	I		
Drive motor												
Check for loud running noise	O								I	I		
Check drawing of current of phases									I	I		
Change gear oil										I	Type CLP 220	
Change roller bearing										I	Type K 3 K	

O ... Operator
I ... IFZW / Southa

Spare parts consumption:

Notes:

..... Executing company
Date, Place, Signature

..... Head of crematorium
Date, place, signature

..... Head of Department
Date, place, signature

Instructions for maintenance and lubrication Cremator ( )

Flue gas cleaning – bag filter

Works to be carried out	Inspection/measure					maintenance					Notes	
	D	W	M	1/2Y	Y	D	W	M	1/2Y	Y		
Check bag filters for closeness, change if required				O					I	I		
Compressed air cleaning												
Check for function		O							I	I		
Check for closeness		O										
Check solenoid valves												
Clean maintenance unit			O									

O ... Operator
I ... IFZW / Southa

Spare parts consumption:

Notes:

.....	.....	.....
Executing company Date, Place, Signature	Head of crematorium Date, place, signature	Head of Department Date, place, signature

Southa Technical Ltd
7/F Paramount Building, 12 Ka Yip Street, Chai Wan HK
Tel 29637122 Fax: 29637101, Web : www.southa.com

Instructions for maintenance and lubrication Cremator ( )

Flue gas fan

wiring diagram no.:

Works to be carried out	Inspection					maintenance					lubricants	quantity
	D	W	M	1/2Y	Y	D	W	M	1/2Y	Y		
Check for balance error - loud running noise	O								I	I		
Renew antifriction bearing										I	After 10.000 hours of operation	
Motor												
Check drawing of current of phases									I	I		

O ... Operator
I ... IFZW / Southa

In addition, the manufacturer's specific instructions for maintenance must be followed!

Spare parts consumption:

Notes:

.....	.....	.....
Executing company Date, Place, Signature	Head of crematorium Date, place, signature	Head of Department Date, place, signature

Southa Technical Ltd
7/F Paramount Building, 12 Ka Yip Street, Chai Wan HK
Tel 29637122 Fax: 29637101, Web : www.southa.com

Instructions for maintenance and lubrication Cremator ( )

Cooling air fan

wiring diagram no.:

Works to be carried out	Inspection					maintenance					lubricants	quantity
	D	W	M	1/2Y	Y	D	W	M	1/2Y	Y		
Check for balance error - loud runnning noises	O								I	I		
Motor												
Check drawing of current of phases									I	I		
Re-grease motor										I	UNIREX N3 (ESSO)	

O ... Operator
I ... IFZW / Southa

Spare parts consumption:

Notes:

..... Executing company
Date, Place, Signature

..... Head of crematorium
Date, place, signature

..... Head of Department
Date, place, signature

Southa Technical Ltd
7/F Paramount Building, 12 Ka Yip Street, Chai Wan HK
Tel 29637122 Fax: 29637101, Web : www.southa.com

Instructions for maintenance and lubrication Cremator ( )

Combustion air fan

wiring diagram no.:

Works to be carried out	Inspection/measure					maintenance					lubricants	Quantity
	D	W	M	1/2Y	Y	D	W	M	1/2Y	Y		
Check for balance error - loud running noises - Check wear and tear	O								I	I		
Clean impeller												
Motor												
Check drawing of current of phases									I	I		

O ... Operator
I ... IFZW / Southa

Spare parts consumption:

Notes:

..... Executing company
Date, Place, Signature

..... Head of crematorium
Date, place, signature

..... Head of Department
Date, place, signature

Instructions for maintenance and lubrication Cremator ( )

Pneumatic ducts

Works to be carried out	Inspection					Maintenance					Notes	
	D	W	M	1/2Y	Y	D	W	M	1/2Y	Y		
Check for closeness		O										
Check hose band clamps at all connections for tightness		O							I	I		
Check pneumatic hoses for flexibility, change if necessary			O						I	I		

O ... Operator
I ... IFZW / Southa

Spare parts consumption:

Notes:

..... Executing company
Date, Place, Signature

..... Head of crematorium
Date, place, signature

..... Head of Department
Date, place, signature

Instructions for maintenance and lubrication Cremator ( )

Cremain treatment system – for line 1 - 4

Works to be carried out	Inspection					Maintenance					Notes	
	D	W	M	1/2Y	Y	D	W	M	1/2Y	Y		
Check for function	O								I	I		
Check rotational direction of grinding drum	O								I	I		
Complete Check by IFZW or manufacturer									I	I		

O ... Operator
I ... IFZW / Southa

In addition, the manufacturer's specific instructions for maintenance must be followed!

Spare parts consumption:

Notes:

..... Executing company
Date, Place, Signature

..... Head of crematorium
Date, place, signature

..... Head of Department
Date, place, signature

Instructions for maintenance and lubrication Cremator ( )

Thermocouple – main burning chamber

wiring diagram no.:

Works to be carried out	Inspection					Maintenance					Notes	
	D	W	M	1/2Y	Y	D	W	M	1/2Y	Y		
Check for function	O								I	I	Plausibility	
Check protecting pipe for damage			O						I	I		

Thermocouple – secondary combustion

wiring diagram no.:

Works to be carried out	Inspection					Maintenance					Notes	
	D	W	M	1/2Y	Y	D	W	M	1/2Y	Y		
Check for function	O								I	I	Plausibility	
Check protecting pipe for damage			O						I	I		

O ... Operator
I ... IFZW / Southa

Spare parts consumption:

Notes:

..... Executing company
Date, Place, Signature

..... Head of crematorium
Date, place, signature

..... Head of Department
Date, place, signature

Southa Technical Ltd
7/F Paramount Building, 12 Ka Yip Street, Chai Wan HK
Tel 29637122 Fax: 29637101, Web : www.southa.com

Instructions for maintenance and lubrication Cremator ( )

Thermocouple - mineralisation

wiring diagram no.:

Works to be carried out	Inspection					Maintenance					Notes	
	D	W	M	1/2Y	Y	D	W	M	1/2Y	Y		
Check for function	O								I	I	Plausibility	
Check protecting pipe for damage			O						I	I		

O ... Operator
I ... IFZW / Southa

Spare parts consumption:

Notes:

..... Executing company
Date, Place, Signature

..... Head of crematorium
Date, place, signature

..... Head of Department
Date, place, signature

Instructions for maintenance and lubrication Cremator ( )

Thermocouple – before economiser

wiring diagram no.:

Works to be carried out	Inspection					maintenance					Notes	
	D	W	M	1/2Y	Y	D	W	M	1/2Y	Y		
Check for function	O											
Check protecting pipe for damage			O						I	I	Plausibility	
									I	I		

Covered thermocouple – after economiser 2

wiring diagram no.:

Works to be carried out	Inspection					maintenance					Notes	
	D	W	M	1/2Y	Y	D	W	M	1/2Y	Y		
Check for function	O								I	I	Plausibility	
Check protecting pipe for damage			O						I	I		

O ... Operator
I ... IFZW / Southa

Spare parts consumption:

Notes:

..... Executing company
Date, Place, Signature

..... Head of crematorium
Date, place, signature

..... Head of Department
Date, place, signature

Southa Technical Ltd
7/F Paramount Building, 12 Ka Yip Street, Chai Wan HK
Tel 29637122 Fax: 29637101, Web : www.southa.com

Instructions for maintenance and lubrication Cremator ( )

Thermocouple – before filter

wiring diagram no.:

Works to be carried out	Inspection					maintenance					Notes	
	D	W	M	1/2Y	Y	D	W	M	1/2Y	Y		
Check for function	O								I	I	Plausibility	
Check protecting pipe for damage			O						I	I		

O ... Operator
I ... IFZW / Southa

Spare parts consumption:

Notes:

.....
Executing company
Date, Place, Signature

.....
Head of crematorium
Date, place, signature

.....
Head of Department
Date, place, signature

Instructions for maintenance and lubrication Cremator ( )

Thermocouple – Reference CO measurement

wiring diagram no.:

Works to be carried out	Inspection					maintenance					Notes	
	D	W	M	1/2Y	Y	D	W	M	1/2Y	Y		
Check for function	O								I	I	plausibility	
Check protecting pipe for damage			O						I	I		

Thermocouple – combustion air pipe warm

wiring diagram no.:

Works to be carried out	Inspection					maintenance					Notes	
	D	W	M	1/2Y	Y	D	W	M	1/2Y	Y		
Check for function	O								I	I	plausibility	
Check protecting pipe for damage			O						I	I		

O ... Operator
I ... IFZW / Southa

Spare parts consumption:

Notes:

.....	.....	.....
Executing company Date, Place, Signature	Head of crematorium Date, place, signature	Head of Department Date, place, signature

Instructions for maintenance and lubrication Cremator ( )

Thermocouple – bypass channel

wiring diagram no.:

Works to be carried out	Inspection					Maintenance					Notes	
	T	W	M	1/2J	J	T	W	M	1/2J	J		
Check for function	O								I	I	plausibility	
Check protecting pipe for damage			O						I	I		

O ... Operator
I ... IFZW / Southa

Spare parts consumption:

Notes:

..... Executing company
Date, Place, Signature

..... Head of crematorium
Date, place, signature

..... Head of Department
Date, place, signature

Instructions for maintenance and lubrication Cremator ( )

Thermocouple – before air preheater - MP2

wiring diagram no.:

Works to be carried out	Inspection					Maintenance					Notes	
	D	W	M	1/2Y	Y	D	W	M	1/2Y	Y		
Check for function	O								I	I	plausibility	
Check protecting pipe for damage			O						I	I		

Thermocouple – after air preheater before economiser 2 - MP3

wiring diagram no.:

Works to be carried out	Inspection					Maintenance					Notes	
	D	W	M	1/2Y	Y	D	W	M	1/2Y	Y		
Check for function	O								I	I	plausibility	
Check protecting pipe for damage			O						I	I		

O ... Operator
I ... IFZW / Southa

Spare parts consumption:

Notes:

.....	.....	.....
Executing company Date, Place, Signature	Head of crematorium Date, place, signature	Head of Department Date, place, signature

Instructions for maintenance and lubrication Cremator ( )

Pressure monitor — wiring diagram no.:
Differential pressure measurement transducer — wiring diagram no.:

Works to be carried out	Inspection					Maintenance					Notes	
	D	W	M	1/2Y	Y	D	W	M	1/2Y	Y		
Check for function	O								I	I	plausibility	

O ... Operator
I ... IFZW / Southa

Spare parts consumption:

Notes:

..... Executing company. Date, Place, Signature

..... Head of crematorium Date, place, signature

..... Head of Department Date, place, signature

Instructions for maintenance and lubrication Cremator ( )

Oxygen measurement behind cremator

wiring diagram no.:

Works to be carried out	Inspection					Maintenance					Notes	
	D	W	M	1/2Y	Y	D	W	M	1/2Y	Y		
Check functions	O										plausibility	
Calibration									I	I		
Check probe									I	I		
Clean pressure reducer									I	I		
Check by manufacturer										I		

O ... Operator
I ... IFZW / Southa

In addition, the manufacturer's specific instructions for maintenance must be followed!

Spare parts consumption:

Notes:

.....	.....	.....
Executing company Date, Place, Signature.	Head of crematorium Date, place, signature	Head of Department Date, place, signature

Instructions for maintenance and lubrication Cremator ( )

Oxygen measurement emission

wiring diagram no.:

Works to be carried out	Inspection					Maintenance					Notes	
	D	W	M	1/2Y	Y	D	W	M	1/2Y	Y		
Check functions	O										plausibility	
Calibration									I	I		
Check probe									I	I		
Clean pressure reducer									I	I		
Check by manufacturer										I		

O ... Operator
I ... IFZW / Southa

In addition, the manufacturer's specific instructions for maintenance must be followed!

Spare parts consumption:

Notes:

.....	.....	.....
Executing company Date, Place, Signature	Head of crematorium Date, place, signature	Head of Department Date, place, signature

Southa Technical Ltd
7/F Paramount Building, 12 Ka Yip Street, Chai Wan HK
Tel 29637122 Fax: 29637101, Web : www.southa.com

Instructions for maintenance and lubrication Cremator ( )

Measurement instrument for CO-concentration (raw gas)

Works to be carried out	Inspection					maintenance					Notes	
	D	W	M	1/2Y	Y	D	W	M	1/2Y	Y		
Check functions	O										Plausibility	
Clean optic (sender and receiver)									I	I		
Zero point control									I	I		
Scavenging air fan – clean filter			O						I	I		
Check by manufacturer										I		

In addition, the manufacturer's specific instructions for maintenance must be followed!

O ... Operator
I ... IFZW / Southa

Spare parts consumption:

Notes:

..... Executing company
Date, Place, Signature

..... Head of crematorium
Date, place, signature

..... Head of Department
Date, place, signature

Instructions for maintenance and lubrication Cremator ( )

Measurement instrument for CO-concentration (After flue gas fan)

Works to be carried out	Inspection					Maintenance					Notes	
	D	W	M	1/2Y	Y	D	W	M	1/2Y	Y		
Check functions	O										Plausibility	
Clean optic (sender and receiver)									I	I		
Zero point control									I	I		
Scavenging air fan – clean filter			O						I	I		
Check by manufacturer										I		

In addition, the manufacturer's specific instructions for maintenance must be followed!

O ... Operator
I ... IFZW / Southa

Spare parts consumption:

Notes:

..... Executing company
Date, Place, Signature

..... Head of crematorium
Date, place, signature

..... Head of Department
Date, place, signature

Instructions for maintenance and lubrication Cremator ( )

Gas analysis MCS 100

Works to be carried out	Inspection					Maintenance					Notes	
	D	W	M	1/2Y	Y	D	W	M	1/2Y	Y		
Plausibility Check									I	I		
Zero point control									I	I		
Scavengin air fan – clean filter									I	I		
Check fill levels for burning and test gases									I	I		
Check by manufacturer										I		

In addition, the manufacturer's specific instructions for maintenance must be followed!

O ... Operator
I ... IFZW / Southa

Spare parts consumption:

Notes:

.....	.....	.....
Executing company Date, Place, Signature	Head of crematorium Date, place, signature	Head of Department Date, place, signature

Southa Technical Ltd
7/F Paramount Building, 12 Ka Yip Street, Chai Wan HK
Tel 29637122 Fax: 29637101, Web : www.southa.com

Instructions for maintenance and lubrication Cremator ( )

Dust measurement

Works to be carried out	Inspection					Maintenance					Notes	
	D	W	M	1/2Y	Y	D	W	M	1/2Y	Y		
Clean optics									I	I		
Zero point control									I	I		
Check by manufacturer										I		

In addition, the manufacturer's specific instructions for maintenance must be followed!

O ... Operator
I ... IFZW / Southa

Spare parts consumption:

Notes:

..... Executing company
Date, Place, Signature

..... Head of crematorium
Date, place, signature

..... Head of Department
Date, place, signature

Checklist Maintenance Cremator ( )

Month:

All Works not marked as **weekly** or **monthly** must be carried out **daily!** (By Operator)

Works to be carried out by the operator	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30
Flue gas gate bypass																														
Functionality test Gate																														
Functionality test Safety limit switch (open)																														
Closeness test Pneumatic connections																														
Functionality test limit switch Pneumatic cylinder (**weekly**)																														
Clean maintenance unit (**monthly**)																														

Southa Technical Ltd
7/F Paramount Building, 12 Ka Yip Street, Chai Wan HK
Tel 29637122 Fax: 29637101, Web : www.southa.com

Checklist Maintenance Cremator ( )

Month:

All Works not marked as **weekly** or **monthly** must be carried out **daily!** (By Operator)

Works to be carried out by the operator	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30
Flue gas gate main channel																														
Functionality test gate																														
Functionality test safety limit switch (open)																														
Closeness control pneumatic connections																														
Functionality test limit switch pneumatic cylinder **(weekly)**																														
Clean maintenance unit **(monthly)**																														

Southa Technical Ltd
7/F Paramount Building, 12 Ka Yip Street, Chai Wan HK
Tel 29637122 Fax: 29637101, Web : www.southa.com

Checklist Maintenance Cremator ( )

Month:

All Works not marked as **weekly** or **monthly** must be carried out **daily!** (By Operator)

Works to be carried out by the operator	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30
Burner - Functionality test																														
Main burner																														
Secondary burner																														
Mineralisation burner																														
Side areas																														
Clean (**weekly**, at least every 50 cremations)																														
Rotary valves – main burning chamber																														
Functionality test valve																														
Functionality test drive																														
Test functionality of limit switch (**weekly**)																														
Closeness test pneumatic connections																														
Clean maintenance unit (**monthly**)																														

Checklist Maintenance Cremator ( )

Southa Technical Ltd
7/F Paramount Building, 12 Ka Yip Street, Chai Wan HK
Tel 29637122 Fax: 29637101, Web : www.southa.com

Month:

All Works not marked as **weekly** or **monthly** must be carried out **daily!** (By Operator)

Works to be carried out by the operator	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30
Rotary valves - Mineralisation																														
Functionality test valve																														
Functionality test drive																														
Closeness test pneumatic connections																														
Test functionality of limit switch (**weekly**)																														
Clean maintenance unit (**monthly**)																														
Rotary valves – Ash cooling																														
Functionality test valve																														
Functionality test drive																														
Closeness test pneumatic connections																														
Test functionality of limit switch (**weekly**)																														
Clean maintenance unit (**monthly**)																														

Southa Technical Ltd
7/F Paramount Building, 12 Ka Yip Street, Chai Wan HK
Tel 29637122 Fax: 29637101, Web : www.southa.com

Checklist Maintenance Cremator ( )

Month:

All Works not marked as **weekly** or **monthly** must be carried out **daily!** (By Operator)

Works to be carried out by the operator	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30
Butterfly valve with actuator – functionality test																														
Secondary combustion zone 1																														
Secondary combustion zone 2																														
Secondary combustion Protection air left																														
Secondary combustion Protection air right																														
Top air																														
Door vacuum cleaning system																														
Bottom air																														
Side air																														
Cooling air flap before filter																														

Southa Technical Ltd
7/F Paramount Building, 12 Ka Yip Street, Chai Wan HK
Tel 29637122 Fax: 29637101, Web : www.southa.com

Checklist Maintenance Cremator ( )

Month:

All Works not marked as **weekly** or **monthly** must be carried out **daily**! (By Operator)

Works to be carried out by the operator	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30
Butterfly valves with acutator – test functionality of limit switch (weekly)																														
Secondary combustion zone 1																														
Secondary combustion zone 2																														
Secondary combustion Protection air left																														
Secondary combustion Protection air right																														
Top air																														
Door vacuum cleaning system																														
Bottom air																														
Side air																														
Cooling air flap before filter																														

Southa Technical Ltd
7/F Paramount Building, 12 Ka Yip Street, Chai Wan HK
Tel 29637122 Fax: 29637101, Web : www.southa.com

Checklist Maintenance Cremator ( )

Month:

All Works not marked as **weekly** or **monthly** must be carried out **daily!** (By Operator)

Works to be carried out by the operator	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30
Heat exchanger – flue gas cooler (monthly)																														
Check for soiling of heating areas (every 250 cremations)																														
Clean heating areas (every 250 cremations)																														

Southa Technical Ltd
7/F Paramount Building, 12 Ka Yip Street, Chai Wan HK
Tel 29637122 Fax: 29637101, Web : www.southa.com

Checklist Maintenance Cremator ( )

Month:

All Works not marked as **weekly** or **monthly** must be carried out **daily**! (By Operator)

Works to be carried out by the operator	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30
Cremain Treatment																														
Functionality test																														
Closeness test (**weekly**)																														
Combustion air fan																														
Check for balance error (loud running noises)																														
Cooling air fan																														
Check for balance error (loud running noises)																														
Coffin insertion machine																														
Functionality test																														

Southa Technical Ltd
7/F Paramount Building, 12 Ka Yip Street, Chai Wan HK
Tel 29637122 Fax: 29637101, Web : www.southa.com

Checklist Maintenance Cremator ( )

Month:

All Works not marked as **weekly** or **monthly** must be carried out **daily**! (By Operator)

Works to be carried out by the operator	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30
Flue gas cleaning																														
Functionality test cleaning **(weekly)**																														
Closeness test cleaning **(weekly)**																														
Emptying of dust containers **(weekly)**																														
Functionality test Ball rotor reactor **(weekly)**																														
Functionality test Dosing system **(weekly)**																														
Control of dosing container stand for additive																														
Functionality test worm conveyor																														

Southa Technical Ltd
7/F Paramount Building, 12 Ka Yip Street, Chai Wan HK
Tel 29637122 Fax: 29637101, Web : www.southa.com

Checklist Maintenance Cremator ( )

Month:

All Works not marked as **weekly** or **monthly** must be carried out **daily**! (By Operator)

Works to be carried out by the operator	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30
Compressor system (monthly)																														
Checking of oil level, re-fill, if necessary																														
Closeness test connections																														
Tighten fastening screws for motor																														
Flue gas fan																														
Check for balance error																														
Check lubrication of bearings																														
Pneumatic pipes																														
Tightness test (**weekly**)																														
Check all hose band clips for tightness (**weekly**)																														
Check flexibility of hoses, replace them if necessary (**monthly**)																														

Southa Technical Ltd
7/F Paramount Building, 12 Ka Yip Street, Chai Wan HK
Tel 29637122 Fax: 29637101, Web : www.southa.com

Checklist Maintenance Cremator ( )

Month:

All Works not marked as **weekly** or **monthly** must be carried out **daily!** (By Operator)

Works to be carried out by the operator	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30
Gas pipes leading to the burners																														
Tightness test (**weekly**)																														
Thermocouples - Functionality test																														
Main burning chamber																														
Secondary chamber																														
Mineralisation																														
Bypass channel																														
before economiser 1																														
before air pre-heater																														
before economiser 2																														
after economiser 2																														
before filter																														
clean gas pipe																														
combustion air warm																														

Southa Technical Ltd
7/F Paramount Building, 12 Ka Yip Street, Chai Wan HK
Tel 29637122 Fax: 29637101, Web : www.southa.com

Checklist Maintenance Cremator ( )

Month:

All Works not marked as **weekly** or **monthly** must be carried out **daily!** (By Operator)

Works to be carried out	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30
Thermocouples – Check protection pipe (monthly)																														
main chamber																														
secondary chamber																														
mineralisation																														
bypass channel																														
before economiser 1																														
before air-preheater																														
before economiser 2																														
after economiser 2																														
before filter																														
clean gas pipe																														
combustion air warm																														
Cremulator																														
functionality test																														
Check direction of rotation of grinding drum																														

Southa Technical Ltd
7/F Paramount Building, 12 Ka Yip Street, Chai Wan HK
Tel 29637122 Fax: 29637101, Web : www.southa.com

Checklist Maintenance Cremator ( )

Month:

All Works not marked as **weekly** or **monthly** must be carried out **daily!** (By Operator)

Works to be carried out	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30
Pressure monitor																														
functionality test																														
Remote radiator																														
Check fans for balance error																														
lubrication of bearings **(monthly)**																														
Check bearings for wear **(monthly)**																														
Diesel Fuel System																														
Check diesel fuel pipe leakage																														
Check fuel valve operation																														
Check level / flow device (monthly)																														
Cleaning accessories (monthly)																														

Southa Technical Ltd
7/F Paramount Building, 12 Ka Yip Street, Chai Wan HK
Tel 29637122 Fax: 29637101, Web : www.southa.com

APPENDIX G
Operation and Maintenance Procedures for Air Pollution Control System

Content

1 Introduction

LÜHR FILTER dedusting plants mostly consist of several single component parts, such as filters, heat exchangers, fan, screw conveyors, dust discharge devices, silos, platforms, ladders, electrical switch devices, etc.

LÜHR FILTER certifies the conformity of flat-bag filter and heat exchanger, according to the standard of the EC- regulations for machines 98 / 37 / EC.

Planning and construction of the complete plant is effected in accordance with the generally accepted rules of technology and the regulations concerning the protection of labour and prevention of accidents, including the VDE-regulations. This has been confirmed by the quarry trade association with the label for proved security.

The control office of the professional committee "Steine und Erden" has awarded the GS-label to the following flat-bag filters and heat exchangers:

Flat-bag filter type	Certificate no.:
MWF	99030
DWF	99031
DF	99032
DFK	99033
DF/DFV	99034
SMWF	99035
SDWF	99036
SDF	99037
SDFK	99038

Flat- tube heat exchanger

type:	Certificate no.:
F	99039
FU	99040
FR	99041

2 Safety instructions

2.1 General instructions

We would like to point out that the plant operator is obliged to inform the responsible staff about the mode of operation and about the corresponding safety instructions of the plant. The training has to be repeated periodically (at least once a year) and has to be proved.

This training is based on this service instruction as well as the following instructions for the prevention of accidents, as far as they are effective for the supplied plant:

e.g.
- VBG 1 General instruction
- VBG 4 Instructions for the prevention of accidents - Electrical plants and working equipment
- VBG 5 Power operated working equipment
- VBG 10 Ascending conveyors
- VBG 15 Welding, cutting and related operating processes
- VBG 112 Silos
- VBG 125 Safety marking of working places

as well as applied and harmonised norms, referring to the individual parts :

- DIN EN 292 Security of machines (Basic ideas, general guiding principles)
  Part 1 : Basic terminology, methodology
  Part 2 : Technical principles and specifications
- DIN EN 294 Security of machines (Safety distances in order to avoid the reaching of danger areas with the upper extremities)
- DIN EN 349 Security of machines (Min. distances in order to avoid squeezing of parts of the body)
- DIN EN 286 Simple unfired compressed air reservoirs for air or nitrogen
- DIN EN 60204 Electric equipment of industrial machines

2.2 Interpretation of symbols and instructions

2.2.1 Safety symbol

The safety symbol in this service instruction is related to the instructions, helping to avoid danger for health and life of persons.

2.2.2 Attention symbol

Attention

This symbol helps to observe the general instructions, regulations, remarks and the correct function of operation, as well as to avoid damage and destruction of machines and/or other plant parts.

2.3 Industrial safety precautions

- **Utilisation according to designation:**

  The delivered plant may only be used for the application described in the order confirmation.
  Other applications are not allowed!

- **Staff:**

  Operation, maintenance and inspections of the plant may only be carried out by qualified staff. The management has to take care that unqualified persons are not admitted to the plant area.

- **Fire risk:**

  Welding and burning at the filter housing and within the whole plant area are prohibited!
  Filter fabrics are combustible or, according to the fibre type, fusible in case of higher temperatures.
  The particles to be separated can also be combustible or self-inflammable.
  Fires and the resulting direct and indirect damages do not come under our warranties.

- **Danger areas:**

  Depending on the size, the plant is provided with several or few automatically starting drives. Controls and repair may only be carried out during standstill of the plant.

- **Modifications:**

  Due to safety reasons, unauthorised reconstructionas and modifications of the plant by customer without agreement of Lühr are prohibited; e. g. replacement of installed temperature sensors by other products.

- **Commissioning:**

  Prior to commissioning the plant operator has to take care that unqualified persons are not admitted to the danger areas.

- Accessories:

  The enclosed operating instructions / safety instructions of accessories have to be observed, e. g. electric drives, etc !

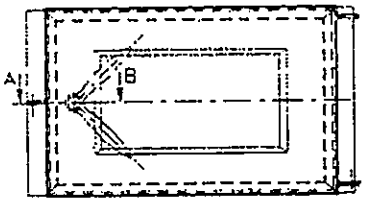
2.4 Control, maintenance and repair openings

Due to the regulations for the prevention of accidents the openings installed in the plant are furnished with bolts or have to be secured with padlock by customer.

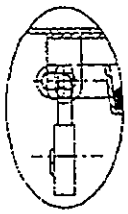
Maintenance and repair have to be carried out according to the "UVV prescriptions for silos VBG 112".

Examples:

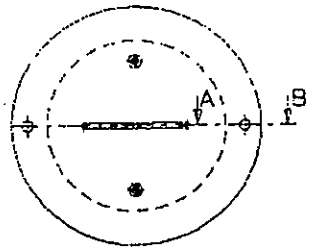
Door size 1 and 3
(securing with padlock)



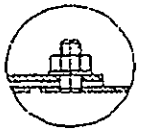
Section A - B



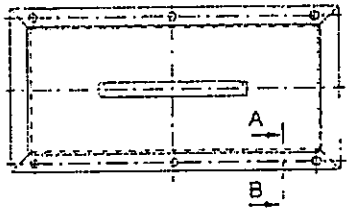
Hand-hole cover
(securing with bolt)



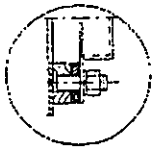
Section A - B



Mounting hole
(securing with bolt)



Section A - B



Pay attention to the following points:

- Opening of control, cleaning and assembly openings only if the plant is switched off (in most of the cases the plant is driven in negative pressure operation!)
- Dust outlet Is possible during opening. Wear protection goggles and fine dust mask!

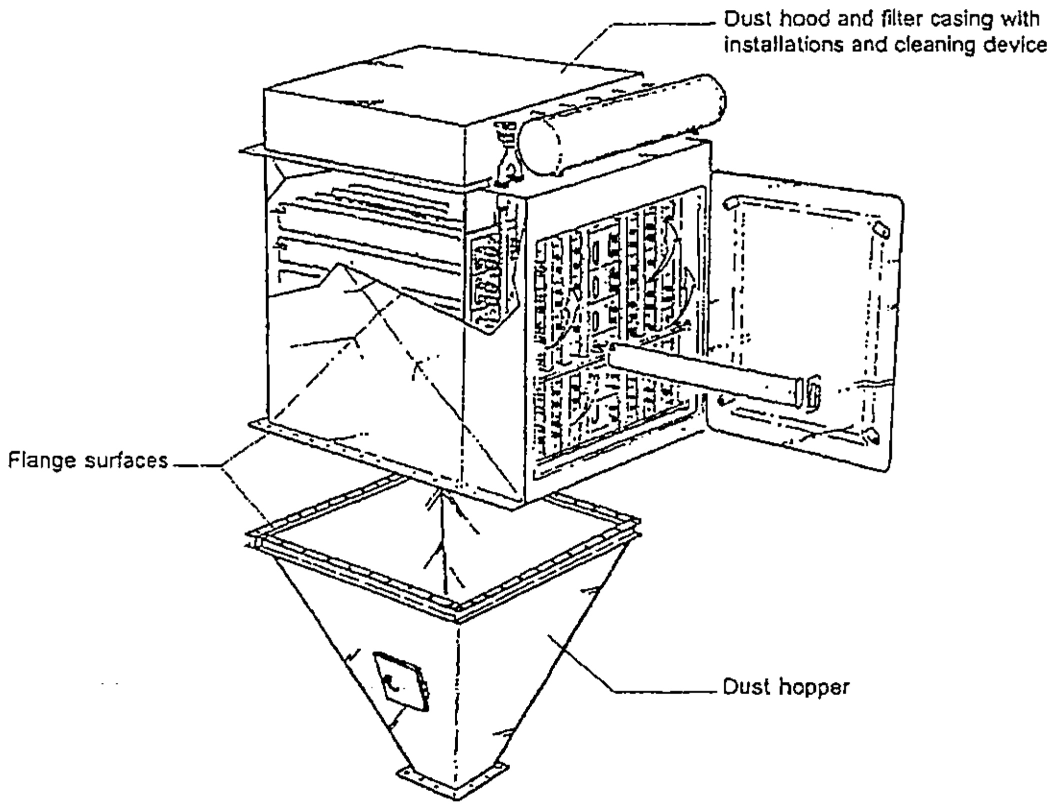
- Access only if:
  - the plant is switched off and secured against re-start
  - there is sufficient aeration
  - there is a supervisor outside the access door
  - the doors are secured against slamming

General informations

Normally DF-filter plants are delivered in compact pre-assembled units:

- dust hood and filter casing with installations and cleaning device
- dust hopper
- discharge device

The units have to be assembled in accordance with the following example:

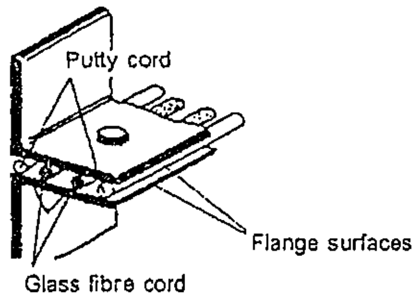


Flange sealing:

- apply special glue onto flange surfaces
- push on glass fibre cord and putty cord tightly
- screw up flange tightly

Screwing material:

hexagon bolts M10 x 30lg with hexagon nuts, DIN 601
square washers, M 10, d=11, DIN 434



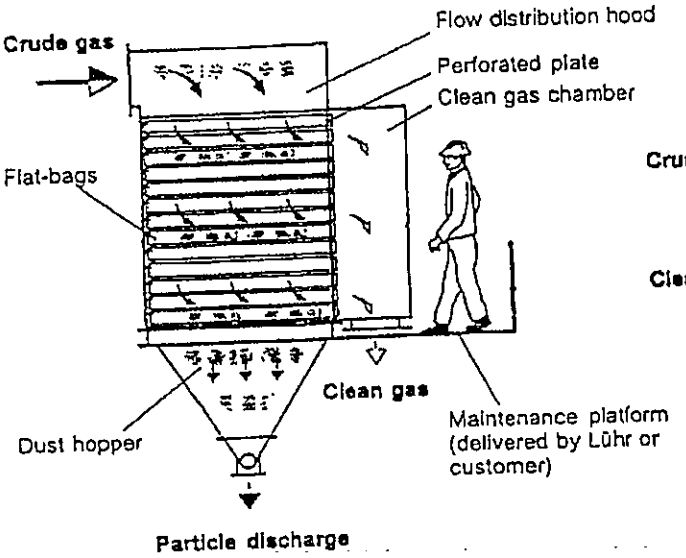
Filter in general

The filter housing is a bolded and welded structure, which is divided into dirty and clean gas compartments by a perforated plate. Access to the clean gas side of the perforated plate is achieved using the large access doors provided.

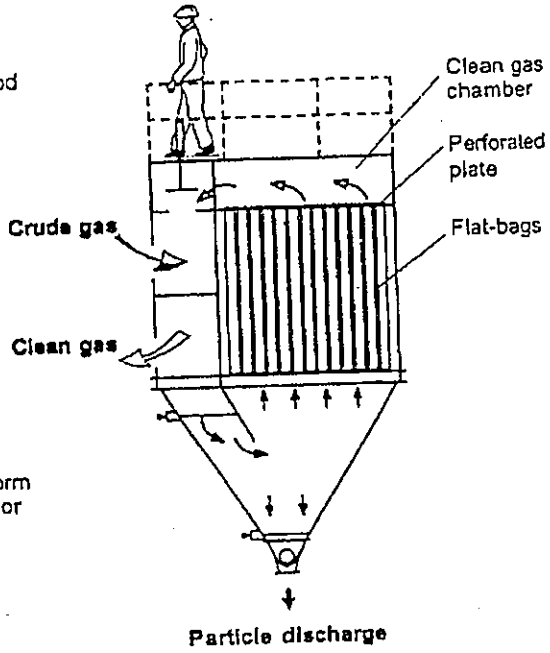
The flat-bags are installed horizontally or vertically into the filter, from the clean gas side. The flat-bags are located exactly on the back wall, and sealed "dust-tight" to the perforated plate, without fasteners. The flow can be from below or above or evenly distributed in both directions.

Schematic layout

Flat-bag filter with horizontally mounted filter elements

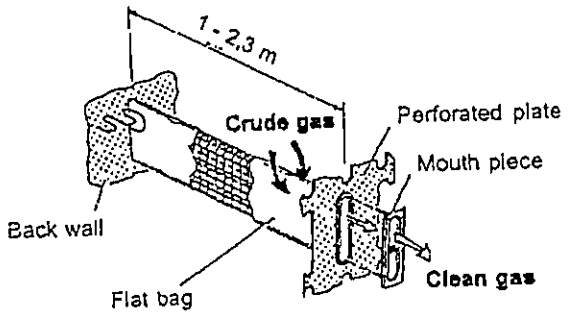


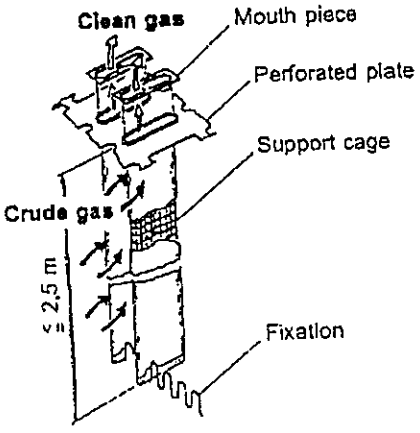
Flat-bag filter with vertically mounted filter elements



Installation survey of the filter elements

Filtering is accomplished on the external surfaces of the fabric flat-bags



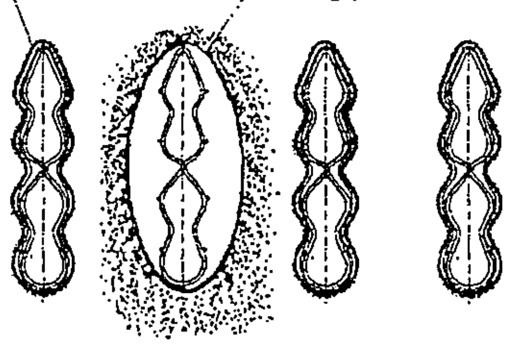


Automatic cleaning of the filter flat-bags

The automatic cleaning of the filter flat-bags is achieved by injecting scavenging air in the reverse flow to the dust loaden gas stream, through a group of flat-bags. The cleaning process can be increased to different particle properties by acceleration or deceleration of the filter fabric.

Different cleaning methods are available subject to the application.

Deformation of filter elements during cleaning process

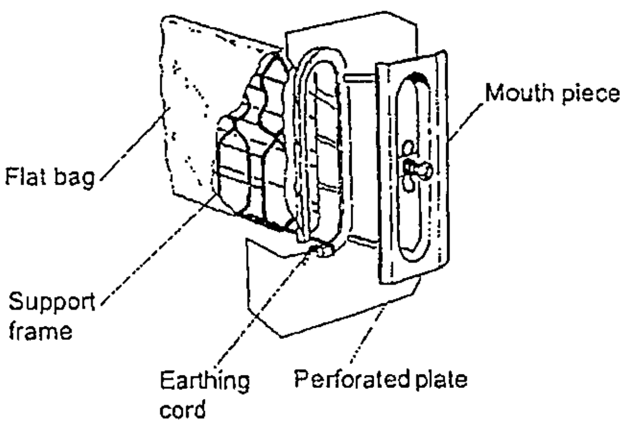


Filtration of dusts with explosion-risk

Generally there is no electrical transfer connection between support frame and filter casing nor between mouth-piece and filter casing (separation through the filter bag material).
Under certain conditions electrostatic charges of the filter elements may occur. If necessary an electric connection can be made by means of an earthing cord between filter elements and filter casing.

In case of dusts with explosion-risk earthened support frames are to be installed.

For flat bag control and flat bag exchange please see TI 141 / ...



DA-AAgVF-ue-3D pm5/02/97Be

Content

Remark: Please take technical data from the data sheets, motor data sheets, spare part lists as well as the circuit diagram which is made out by our electro-bureau.

1 Security advices

Opening of doors resp. of assembly openings only when plant is stopped
(in most cases plant is operated with depression!)
Secure doors against slamming!

Risk of falling down during connection of clean gas ducting in the bottom plate area!
Secure openings of assembly covering!

Control and repair works after an overheating/fire in the plant are allowed only with breathing protection and/or sufficient aeration.

Controls are to be executed by trained personnel only.

Adjustment works only when plant is switched off and secured against switching on.

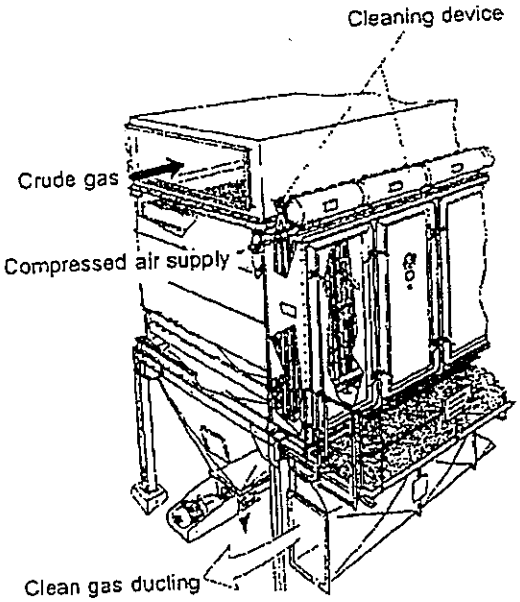
A control of the individual component parts is allowed only when plant is on standstill!

In case inspections or works outside the access platform are to be carried out, the necessary measures against personnel falling down have to be carried out.

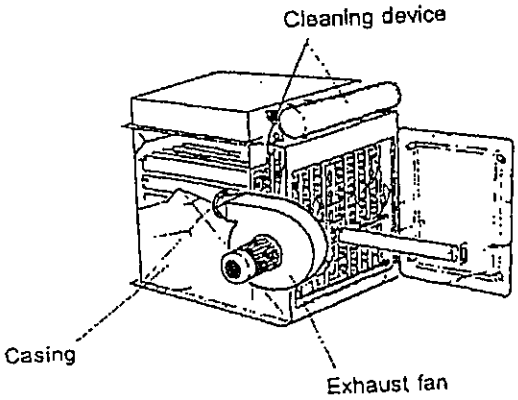
Prior to works at compressed air components these have to relieved/have to be without pressure, resp.:
- compressed air reservoir
- compressed air ductings
- solenoid valves etc.

2 Surveys

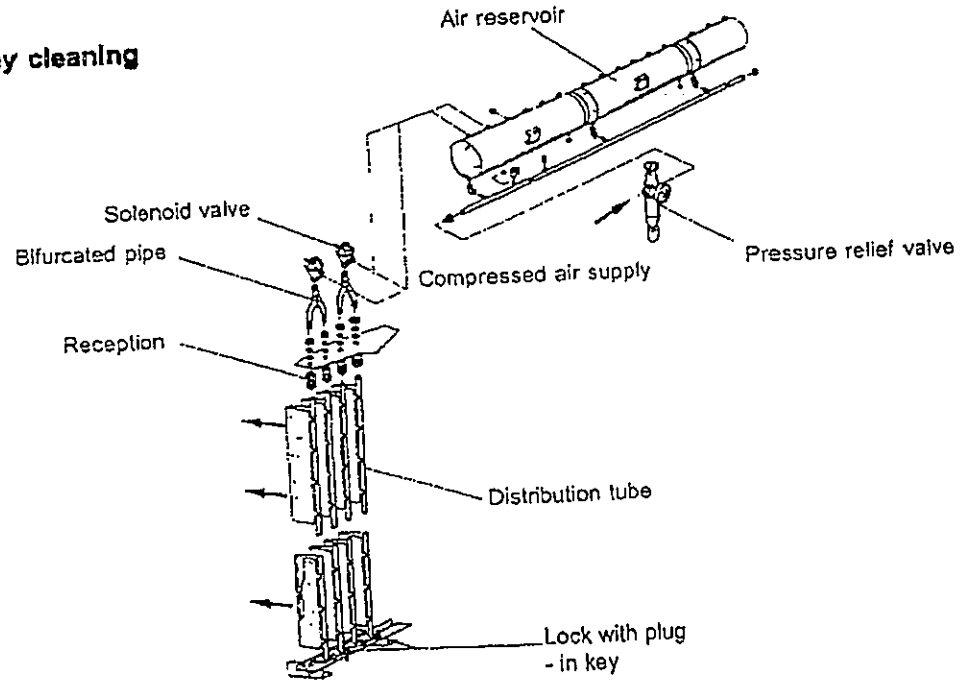
2.1 Survey DF - Filter



2.2 Survey DFV - Filter



2.2 Survey cleaning



3 General description of components

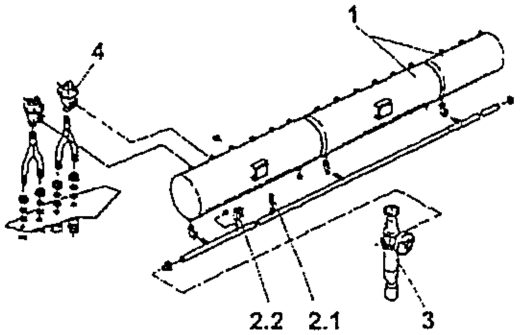
(Pos.1) Compressed air reservoir

The dimensioning is effected in accordance with the regulations for pressure reservoirs VGB 17.

⚠ **According to the national regional prescriptions, pressure reservoirs have to be licensed at the local authorities!**
The prescribed regular inspections have to be observed!

(Pos.2) Compressed air supply

a) from existant ring ducting
b) directly from compressor



The compressed air reaches the compressed air reservoir by a sufficiently dimensioned ducting via an intermediate maintenance unit **(Pos. 3)**, consisting of filter pressure regulating valve and automatic condensate relief (*adjustment of operation pressure at filter pressure regulation valve 6 bars*). According to the regulations for compressed air reservoirs a **security valve (Pos. 2.1)** (*pressure adjustment 8 bars*) is installed in the connection ducting from the maintenance unit to the compressed air reservoir. Additionally a **PE-converter (Pos. 2.2)** may be present (*adjustment 4,5 bars*), which causes a fault notification in case the minimum operation pressure falls short. Further automatic safety circuits, e.g. **"Plant off"**, can be used depending on a time-varying pressure measurement.

Attention! **Presupposition for a correct functioning of the cleaning is dry, clean and oilfree compressed air.**

Attention! **All ducting, flexible tubes and screw connections are to be checked regularly in respect of untightness and damages.**

(Pos.3) Maintenance unit - filter- compressed air regulation valve with automatic condensate relief is applied to:

- regulate the fluctuating duct pressures (max. 10 bars from compressor) to the required operating pressure (6 bars).
- clean compressed air from solid and fluid parts to secure a relatively dry and clean compressed air for the cleaning of the flat-bags.

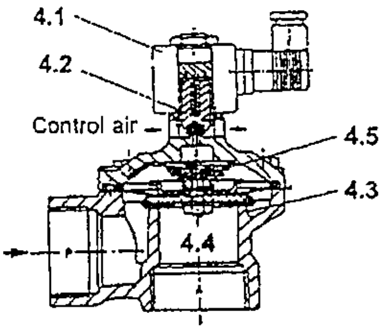
Attention! **The required operating pressure has to be checked regularly !**

Attention! **The operation instruction filter-pressure regulating valve with automatic condensate relief consists of further informations about the valve sizes, installation and maintenance.**

(Pos.4) 2/2 way valve, electromagnetically and indirectly operated

Opening function:

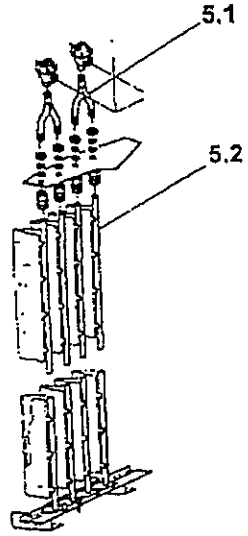
If the valve **(Pos. 4.1)** is energized, the relay valve **(Pos. 4.2)** is opened. The medium pressure above the sealing element membrane **(Pos.4.3)** is reduced via the opened relay position in direction to the valve exit. The pressure difference resulting hereof lifts up the sealing element and opens the main valve **(Pos. 4.4)**. Due to the fact that the boring is smaller than the relay position, the sealing element remains relieved and opened by means of the medium pressure.

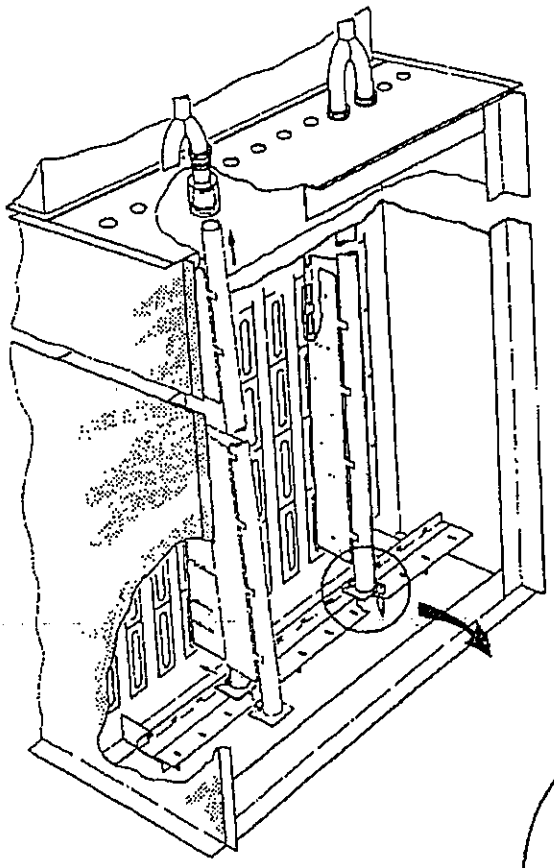


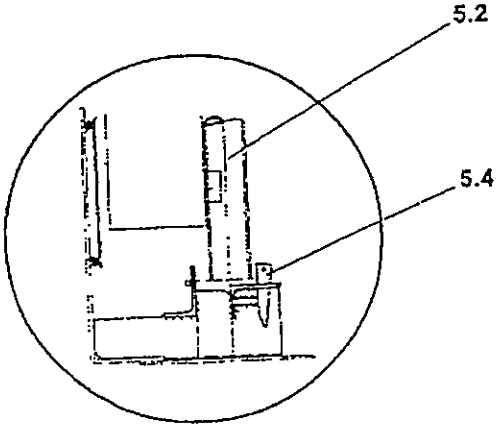
Closing function:

When the exciting voltage is switched off the relay valve is closed whereby the operating pressure at the pressure connection charges the sealing element via the boring and closes the main valve.
The sealing element is additionally charged by a closing spring **(Pos. 4.5)**. The flow direction of the medium is fixed and indicated at the valve casing.In case of repair resp. maintenance works at the pressure reservoir resp. at the compressed air ducting, they have to be released/have to be without pressure - see operating instruction "Relief of compressed air reservoirs".

(Pos. 5) Bifurcated pipe (5.1) and **distribution tube (5.2)** serve the conveyance of compressed air to the individual flat-bag rows.
The connection bifurcated pipe - perforated blast pipe builds a take-in bushing (with internal silicon sealing ring). In the lower area the perforated blast pipe is taken in from a firmly integrated fixing device which is secured against torsion. Additionally it is secured by a plug-in key **(5.4)**.
For replacing the flat-bags the perforated blast pipes have to be removed - *see assembly instruction „Installation and removal of perforated blast pipes"*.

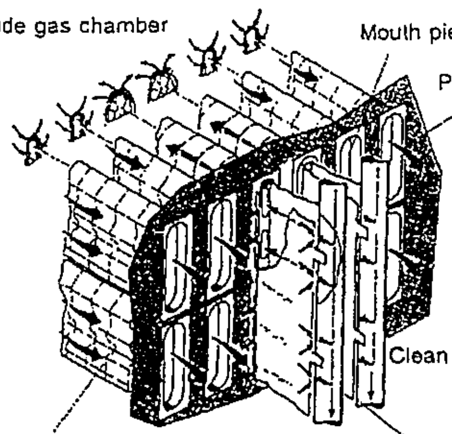






4 Description of general function

A compressed air on-line cleaning is applied for the automatic regeneration of the flat-bags.
In front of each flat-bag row compressed air distribution tubes are arranged within the clean gas channel.
Two flat-bag rows are cleaned at the same time.
A pause between two cleaning processes has a duration in dependence of the specific application. The minimal duration is 10 seconds because this time is necessary for filling the compressed air reservoir. In case a Δ p-control is applied, this time may be reduced by achieving an adjusted max. pressure.



Index

1 Safety provisions for workers

The safety provisions for workers concerning the whole plant must be observed.

Staff

- Maintenance and control works of the plant must be executed by qualified staff only. The management has to take care that unqualified persons are not admitted to the plant area.

- The plant should be controlled regularly within a constant time period.
  Deficiencies, damages and functional disorders must be immediately eliminated.

- It is recommended to write down all occurrences like interruptions and maintenance work in a shift-book.

Risk of injury

- For access to the plant, the warning plates and safety signs must be observed!

- In case of work above stature, ascent accessories and working platforms provided or other safety-proof devices must be used. Machine parts must not be used as ascent device!
  For maintenance work in great heights, wear safety belts protecting from fall!

- Control and repair works after an overheating / fire in the plant are allowed only with breathing protection and / or sufficient aeration.

- Before maintenance / repair work:
  - In case of work at electric parts and other parts hot alive according to service conditions, the following instructions must be observed: In case of non-observance danger to life!
    - switch off plant by means of main switch and protect against restart!
      Fix warning board ! Inform works manager!
    - control whether plant is without strain
    - Prescriptions of the VDE as well as of VBG 4 (UVV 7.0) of BG must be strictly observed.

  - During work on the compressed air components these have to be released in respect of tension and pressure e.g.:
    - compressed air reservoir
    - compressed air ducting
    - solenoid valves etc.

  - At works in the filterhousing secure doors against slamming !

  - Switch-off heating circuits of the component parts to be repaired and wait until the part is cooled down.

- After termination of maintenance / repair work :
  - All protective devices and in case duct connections must be orderly mounted and tightly screwed.

2 Maintenance list

Attention **The DF(V) - filter must be regulary serviced. Insufficient and incorrect maintance will result in operating failures.**

Attention **As wear and deposits are depending on various factors, the control intervals should be adapted to the local conditions!**

The following component parts must be controlled or maintained:

Component	Maintenance Interval / Control
- compressed air ducting, tubes and screwing	check the tightness
- maintenance unit - operation pressure	the operating instruction filter pressure regulator contains information about the check to be made every day, fixed operating pressure 6 bar
- compressed air reservoir	The repeat inspections prescribed regionally have to be carried out
- solenoid valve	every three months the components have to be checked concerning wear, spare part exchange - see **Chapter 2.2**
- flat - bags	every three months see **Chapter 2.3** - "Tracing of defective flat-bags".
- door sealing	every three months The components have to be checked wear, concerning, eventual exchange for dismounting and mounting see details **Chapter 2.5**
- if existing: chain curtain in preliminary filter, in setting chamber or filter hood	During initial operation check of deposits and cleaning every four weeks. Increase or reduce control intervals according to the extend of impurities.

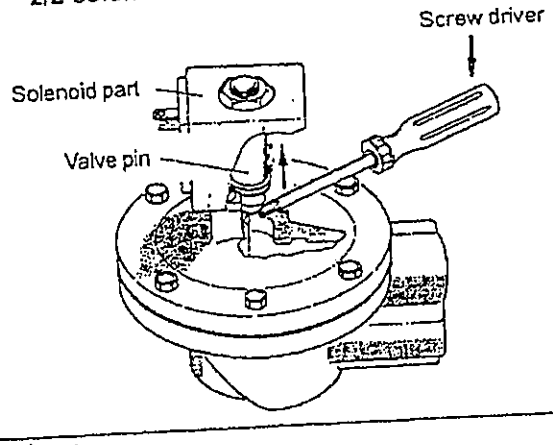
2.1 "Release of pressure" resp. release of tension of DF(V) - compressed air reservoirs

Prior to any kind of work on the compressed air reservoirs resp. compressed air ductings they have to be released in respect of tension and pressure.

The following measurements are to be taken for the manual „or release of tension" of DF(V) - compressed air reservoirs:

- Interruption of the compressed air feeding (e.g. The ball cock in front of the compressed air reservoir has to be shut off.)
- Lift up slightly valve pin of solenoid part by a screw driver (see picture) and means of thus releasing a cleaning impulse. By repeating this procedure several times, the compressed air reservoir is emptied.

2/2 solenoid valve



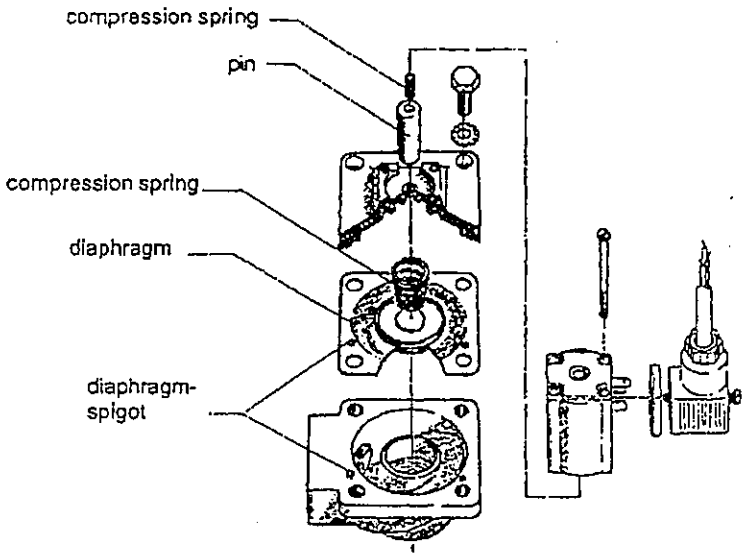
2.2 Repair of defective solenoid valves

Before maintenance and upkeep work on defective solenoid valves, the compressed air reserviors have to be released in respect of tension and pressure!

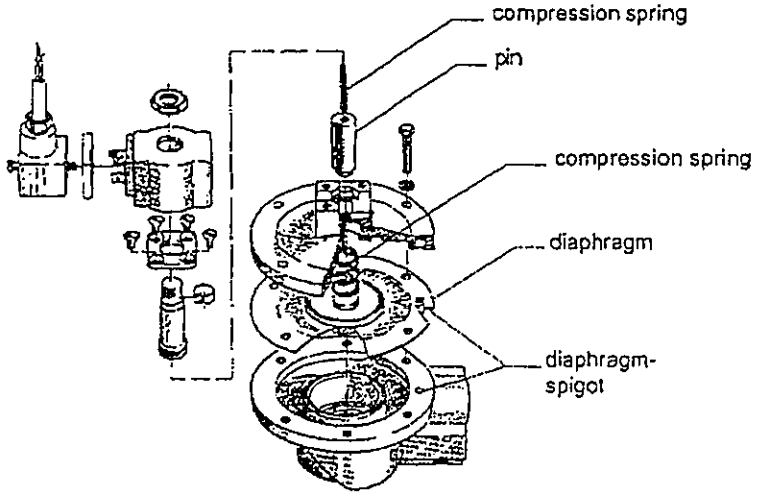
In case of defective solenoid valves, worn out parts can be replaced.
For dismounting and mounting of the wear parts see drawing.

Attention **The diaphragm is adjusted by a spigot on the lower part of the valve!**

2/2 solenoid valve, R1"



2/2 solenoid valve, R 1½"



2.3 Tracing of defective flat-bags

Defective flat-bags can be found out due to increased residual dust contents in the clean gas by :

a) **Optical control of the clean gas outlet opening**

b) **Measurement by means of a measuring device for residual dust contents (e.g. Sick, DURAG)**

c) **Test with greased bar** : A bar-like object, e.g. a clean welding wire, is greased and introduced into the clean gas ducting through a measuring hole for one cleaning cycle. Then the object is drawn back carefully and controlled in respect of attached particles.

The following methods can be applied to trace the defective filter bags:

1 Control of the clean gas channel

For switching on or off the filter plant or opening of the doors, the safety precautions of the Operating Instructions must be observed.

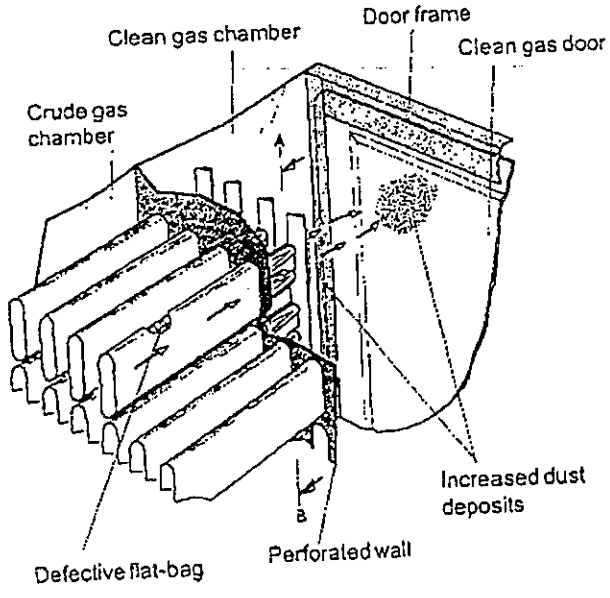
Switch off the dedusting plant and open the clean gas doors. Remarkable, locally limited dust deposits resp. abrasions

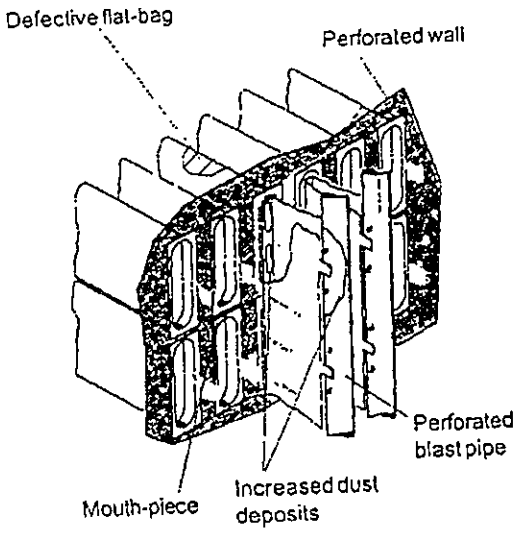
a) **on the interior surfaces of the clean gas doors**

b) **at the mouth-pieces**

c) **at the perforated blast pipe** (only DF - / DFK - Filter)

indicate defective flat-bags





2 Injection of fluorescent powder

The powder is injected on the crude gas side of the dedusting plant, if possible near the filter crude gas inlet connection piece, as follows:

a) Open the assembly opening in the crude gas ducting and secure it against slamming

b) Operation of the dedusting plant **without** cleaning device

c) Inject approx. 200 g of powder per 100m² filter area

d) Switch off the plant after approx. 5 minutes

e) Open the clean gas door

f) Switch-on the portable ultraviolet hand lamp and test the perforated wall by lighting.
The testing powder consists of fluorescent materials becoming visible due to ultraviolet light.

On the clean gas side of the dedusting plant, in the area of rows of damaged flat-bags, deposits of the powder are visible on the **support frames**, the **mouth-pieces** resp. the **perforated blast pipes** as well as on the **interior surfaces** of the **clean gas doors**.

Measures :

- Determine deposits of residual powder to the respective flat-bags and mark them
- If no damaged bags are found, shut the clean gas doors
- Switch on the dedusting plant **including** cleaning device
- After two cleaning cycles, control the clean gas chamber again in the above described manner and mark possible new powder penetrations. Use a test powder of another colour.

3 Instructions for the supply of the ultraviolet lamp and of the fluorescent powder:

I. **Ultraviolet hand lamp, focussing (6 Watt / 2 x 6 Volt) :**
Supplier : Fa. Wolfgang Kupke
Filtermedien GmbH & Co.KG /
Beckum - Neubeckum

II. **Fluorescent powder:**
Make : "FIESTA-FLUORTRACER"-
Air filter control system
Supplier : Fa. Langer & Co / Rittershude

Remark: The above mentioned material can be supplied also by Messrs. LÜHR.

2.4 Flat - bag exchange

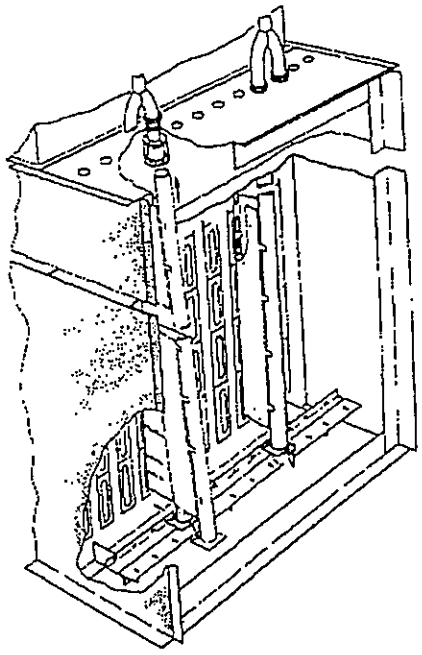
Procedure :

- dismantle perforated blast pipes
- hang in inspection platform in case of filters of 3,0 m height
- for flat - bag exchange see accessories
- install perforated blast pipes
- commissioning of filter

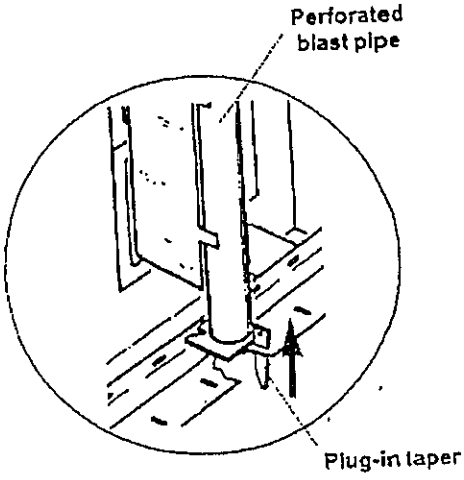
2.4.1 Assembly and dismantling of perforated blast pipes

For replacement of defective filter-bags, the corresponding perforated blast pipes must be dismantled as follows:

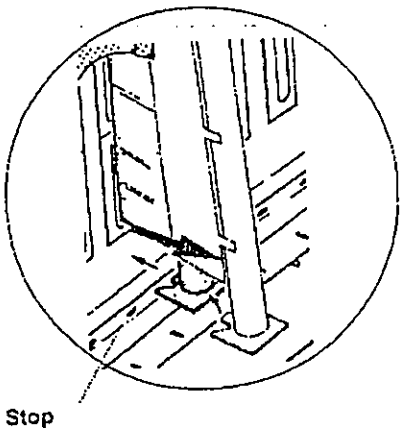
Survey



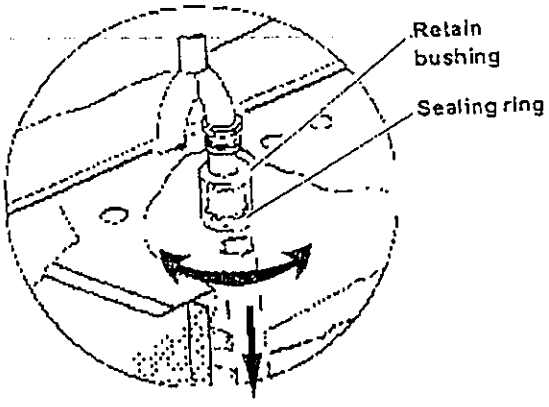
1 Loosen and remove plug-in taper by special tool or hammer.



2 Pull out perforated blast pipe from stop (safety device against torsion).



3 Pull out perforated blast pipe by slight turn of retain bushing.



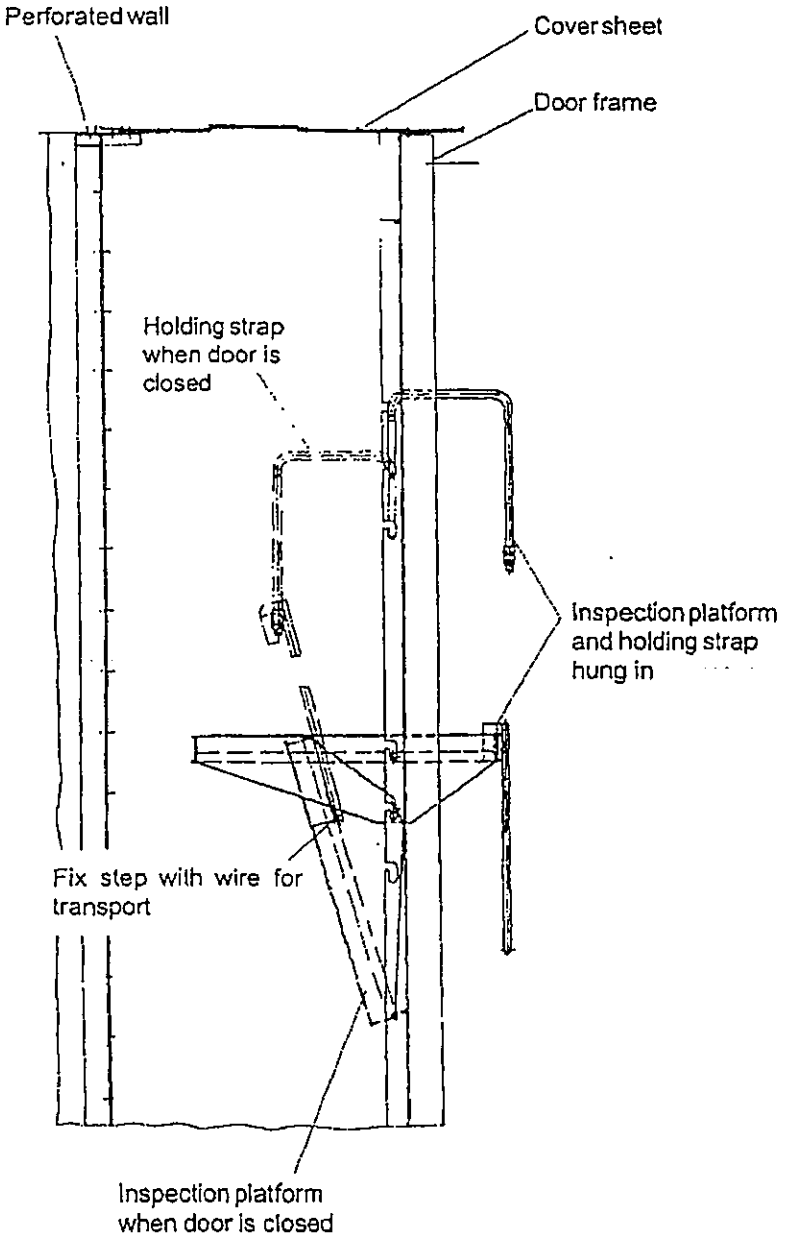
Prior to assembly of the perforated blast pipes, the right position of the sealing ring within the retain bushing has to be checked. For assembly the proceeding has to be executed inversely (Point 1-3)

Attention Introduce the plug-in taper from top to bottom into the stop !

Attention

In case of assessing defective filter bags these bags have to be exchange according to leaflet "Flat-bag inspection/flat-bag exchange". An inspection platform as assembly aid can only be installed in 3,0 high filters.

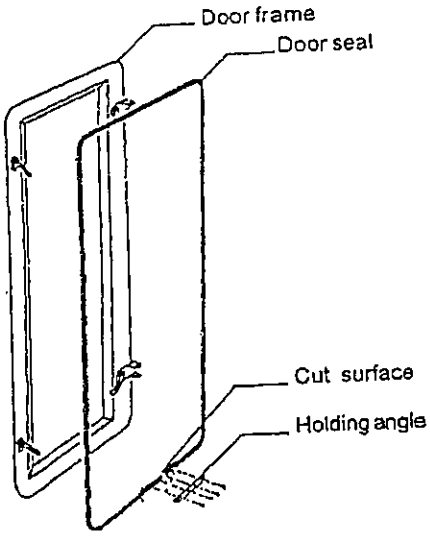
2.4.2 Installation survey for inspection platform at 3,0 high filters



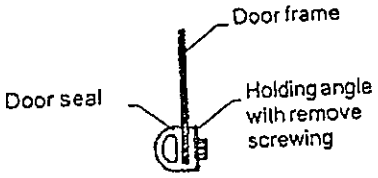
2.5 Dismounting and mounting of door seal

Dismounting
- remove holding angle
- remove door sealing

Mounting
- place door seal circulating door frame, the cut surface in center of the holding angle
- screw up holding angle with door frame



View around the holding angle



Door frame with door seal

3 interruptions

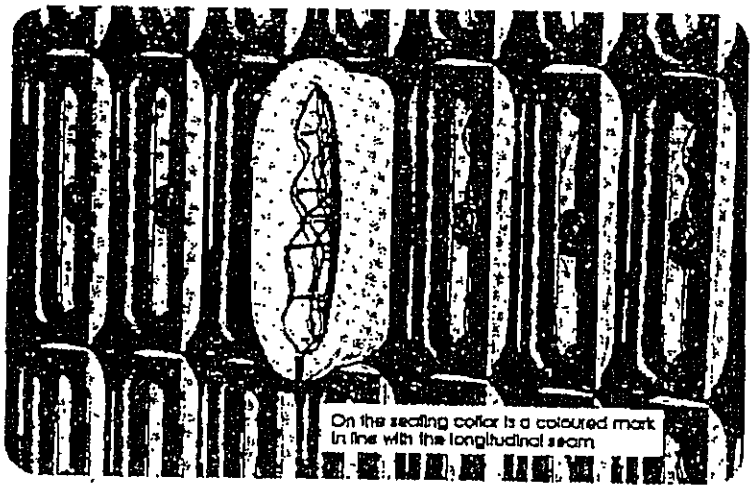
Failure	Possible cause	Measure
- insufficient cleaning - too high Δ p	- service pressure too low	- check the pressure at the filter pressure regulator - 6 bar check the tightnes and the wear of the ducting, the tubes and the screwing, faults must be eliminated
	- solenoid valve does not work - diaphragm defect - no steering voltage - dirt particles close build-up bore	- check wesr parts dismounting
	- if existing: pneum. defective cleaning device of chain curtain	- check, repair fault, clean the chain curtain
	- electrical fallures	- fault tracking in the control programme
- too much dust in the clean gas	- flat - bag defect	- check, eventual flat - bag exchange

Lühr Flat-Bag Filter

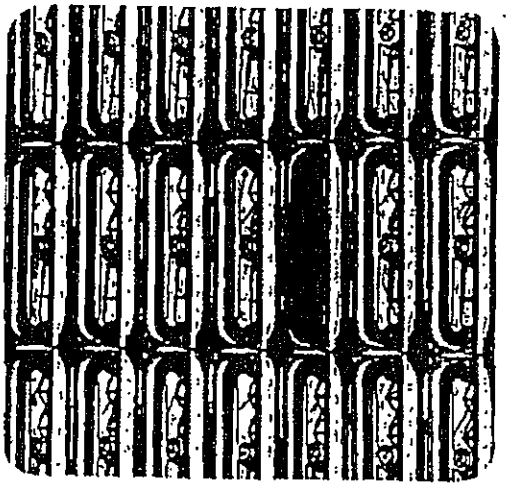
Flat-Bag inspection, Flat-Bag exchange

General Instruction :

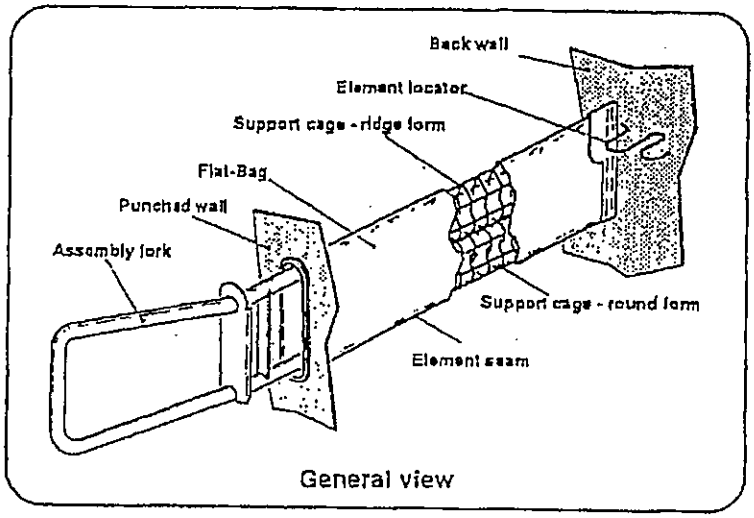
Inspection and Flat-Bag exchange is carried out from the access platform to the side of the clean gas compartment.



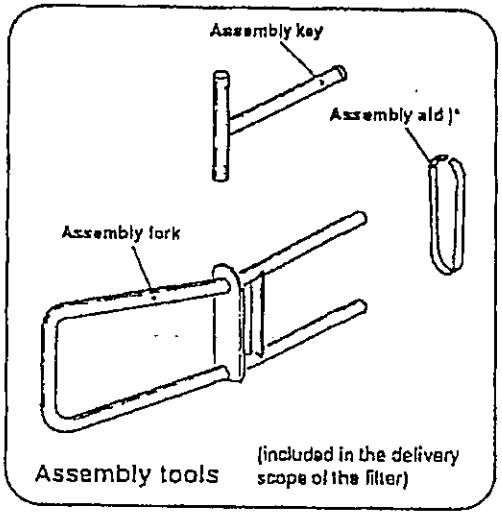
View on the punched wall (with a Flat-Bag element partially removed)



By fitting of quick action sealing caps individual damaged Bags can be taken off line until such time that they can be exchanged.



General view



Assembly tools (included in the delivery scope of the filter)

*) Use only with special filter materials (see information on page 4)
Device for fitting and removal of filter Bags see figure 7

Replacement of a large quantity of Flat-Bags :

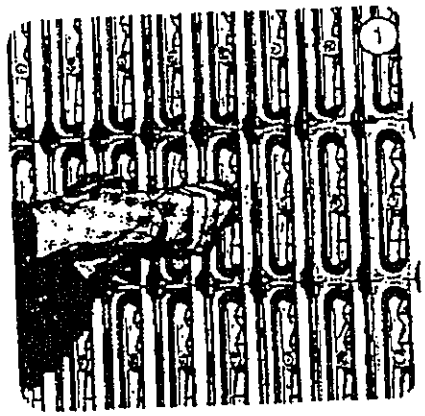
Whilst the Flat-Bags and support cages are located within the filter housing they are protected against damage. Therfore only a limited number of filter elements should be stored outside the filter housing. The number of element assemblies to be handled at any given time is dependent upon the space available in the area of the filter doors.

LÜHR FILTER GmbH & Co.KG · D-31653 Stadthagen
Telephone: (05721) 708-0 · Telefax: (05721) 708-214 · E-Mail: INFO@LUEHR-FILTER.de · Enzer Straße 26
M.FI 50.00.0 E

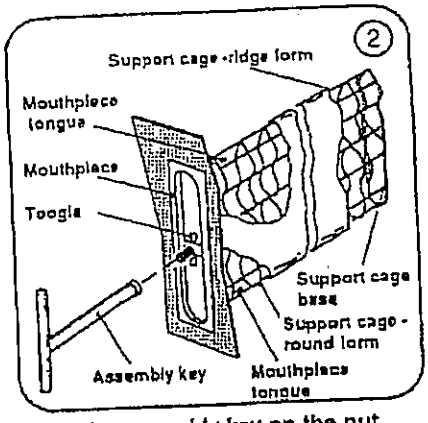
Lühr Flat-Bag Filter

Flat-Bag exchange

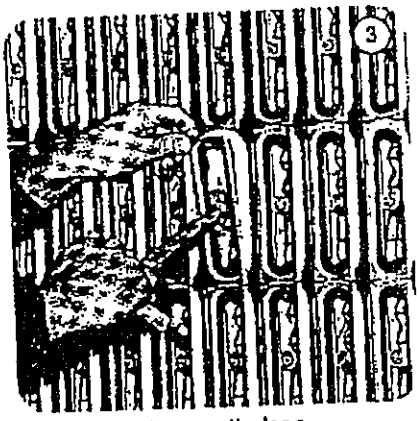
Flat-Bag removal



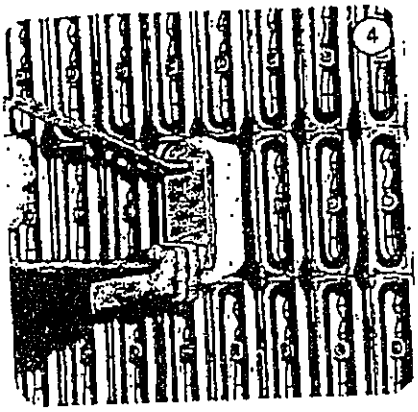
Loosen the toggle



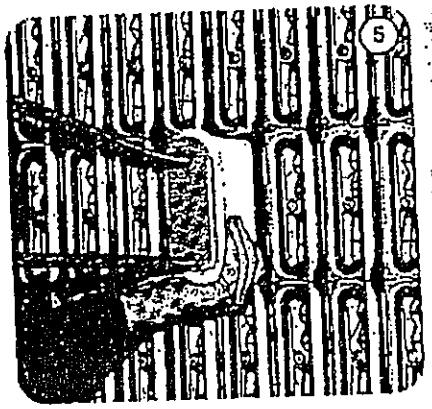
Stack the assembly key on the nut, press in as far as possible and only then turn through 90 degrees.



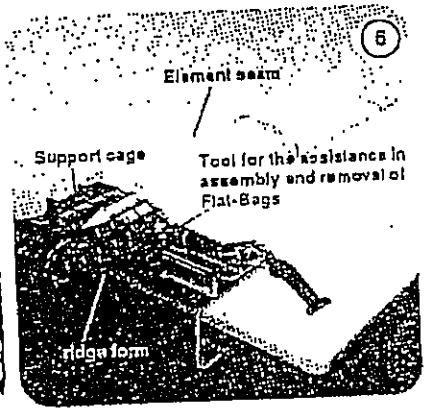
Removal of the mouthpiece



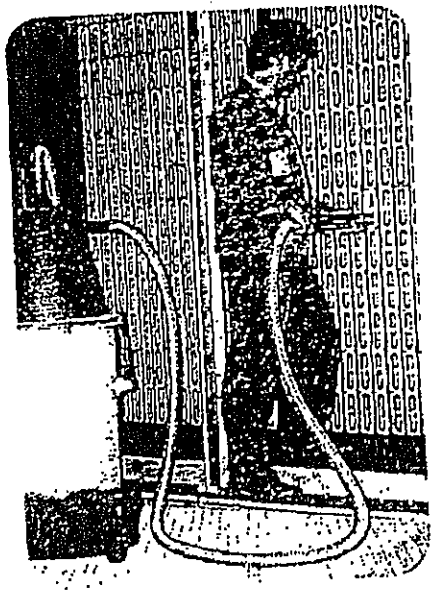
Enter the assembly fork into the Bag opening



Remove the Flat-Bag using the assembly fork



Withdraw the support cage from the Flat-Bag using the assembly tool.
Place the Flat-Bag opening over the tongues of the assembly tool operate the toggle lever to expand the opening of that Flat-Bag and slide out the support cage.



In the event of the damaged Flat-Bags being partly filled with dust they may be quickly cleaned by the use of a cyclonic vacuum cleaner *) with a suitable dust probe prior to removal of the elements from the filter.

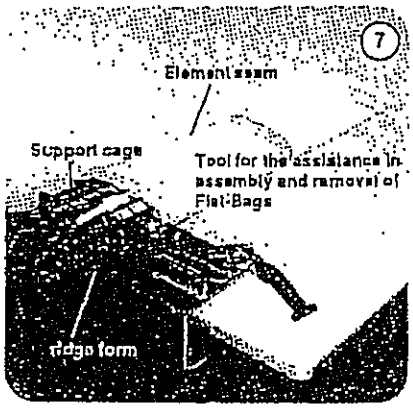
*) Industrial vacuum cleaners or centralised vacuum cleaner systems are suitable for this application.

When exchanging a large number of Flat-Bags it may be advantageous to use a mobile trolley.

Lühr Flat-Bag Filter

Flat-Bag exchange

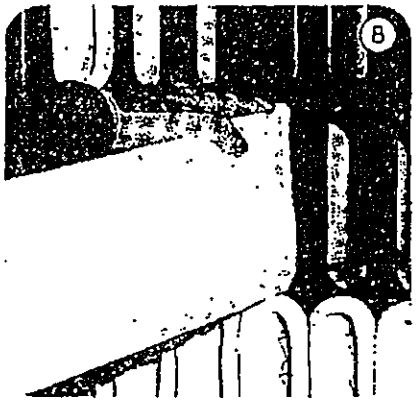
Flat-Bag installation



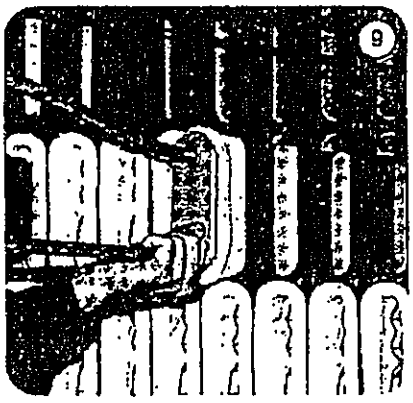
Assemble the new bag and cage using the assembly tool (Assembly tool is also delivered).

The Bag is assembled with the aid of an assembly tool which is fixed to a bench of suitable length to support the entire Bag, this being positioned at a suitable location in the work area. The opening of the Flat-Bag is slid over the tongues of the assembly tool. The toggle lever is operated to expand the opening of the Flat-Bag so that the support cage can be easily slid into the Bag.

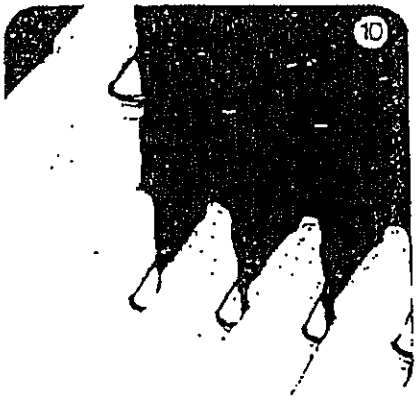
When fitting new Bags it is advantageous to commence the installation with the lower row and work upwards, then all subsequent rows will be supported by the previously installed row.



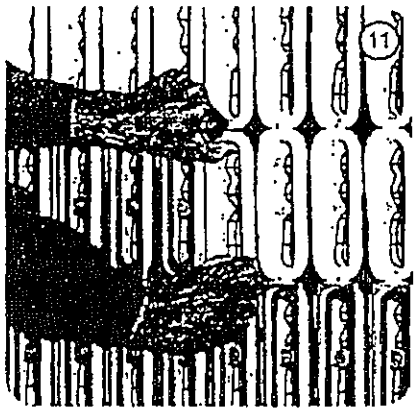
Position the Flat-Bag element before entering.



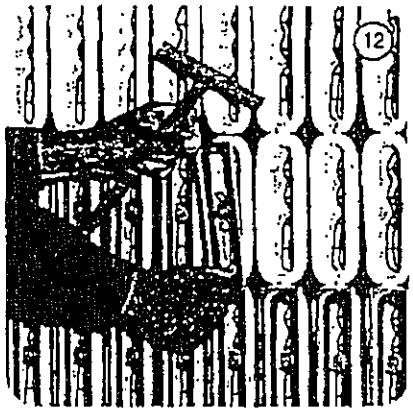
Enter using the assembly fork



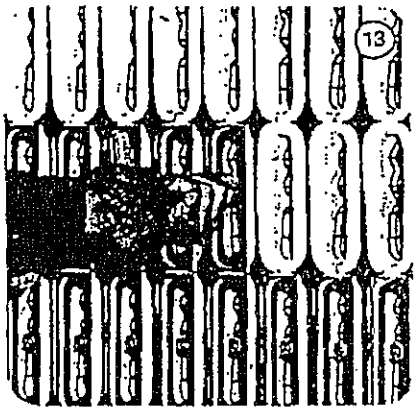
Locate onto the back wall



Position and align the Bag sealing collar.
(Seam to underneath, as indicated by coloured marking, see page 1)



Place the mouthpiece in position
Important : Both tongues on the mouthpiece must be entered into the support cage.

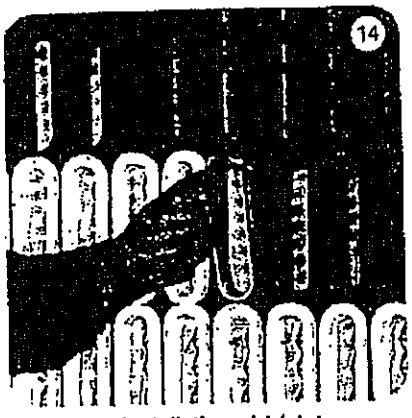


Press and fix the mouthpiece
(Using the assembly key press the toogle in as far as possible and then turn through 90 degrees.)

Lühr Flat-Bag Filter

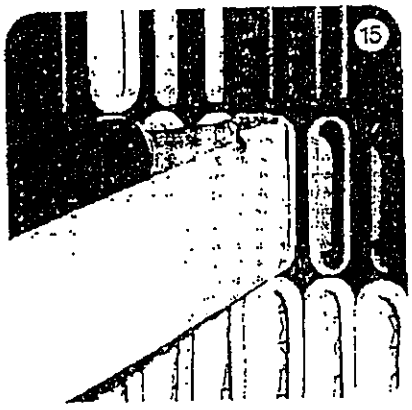
Flat-Bag exchange

Flat-Bag installation of special filter - materials using *installation aid*

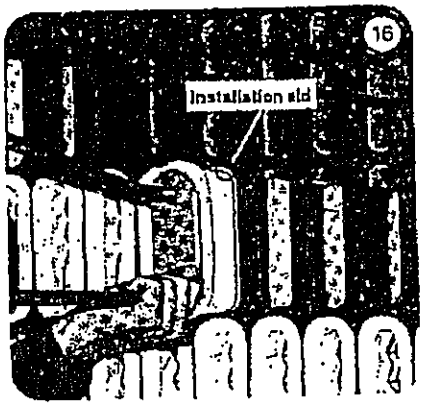


Insert the installation aid (slot-opening to the top) before entering the element through the punched wall.

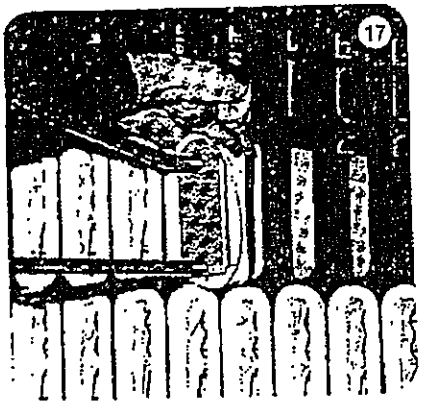
Fragile filter - material qualities for example micro - porus or membrane coated Flat-Bags as well as needle felts with a specific weight of < 350 g/m² have to be protected against damage during assembly through the punched wall of the filter. This is achieved using our ***installation aid.***
Upon request this installation aid together with an additional information sheet can be added to the delivery schedule.



Place the Flat-Bag element in position before entering through the punched wall.



Enter the element through the punched wall using the assembly fork



Remove the installation aid and place into the adjacent slotted hole. Slide the Flat-Bag element fully home. Align the Flat-Bag flange and fit the mouthpiece in accordance with diagrams 11 - 13.

When replacing flat-bag elements of filter plants charged with toxic dust, the technical information sheet 142 (TI-142) has to be observed. On request, please contact our head office.

The requested residual particle emissions can only be granted if the flat-bag elements are duly installed.
In case of faulty installation the claim for guarantee will be rejected.
For further information please contact our consultants in the service department.
Persons to contact are Mr. Schneemann and Mr. Heine. Tel. (05721) 708-134 or 708-137.
For urgent cases out of office hours (Monday – Thursday 7^{00} – 16^{00} / Friday 7^{00} – 14^{00}), you can use our hotline (0172) 5 13 80 25.

LÜHR FILTER GmbH & Co.KG · D-31653 Stadthagen
Telephone: (05721) 708-0 · Telefax: (05721) 708-214 · E-Mail: INFO@LUEHR-FILTER.de · Enzer Straße 26

Conditioning Rotors (patented)

Objectives for application, description, function, installation examples

General

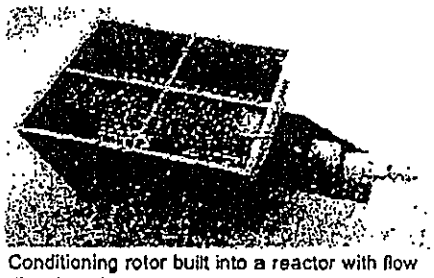
Conditioning rotors are installed to provide reliable recirculation of the collected particulate. The system can operate with difficult to handle, adhesive particulate in combination with high dust loads. A portion of the dust removed at cleaning of the flat-bags, falling to the hopper, is recirculated to the incoming gas flow through a conditioning rotor.

Objectives

- Reduced cost for absorbent feed, through increased rate of recirculation of partially reacted absorbent, in gas absorption and adsorption applications.
- Reduced energy cost for the collection of very adhesive, fine particulate due to the continuous pre-coating of the filter bags with agglomerated particles.
- Provision of a compact mixing device for gas streams and for re-distribution of particles in the incoming gas flow.

Description

The conditioning rotor is a circular shell of perforated metal with 30 x 30 mm perforation size. It is filled to approx. 20 % of its volume with spherical balls made from a heat and wear resistant ceramic. The rotor is mounted on bearings outside the hopper housing and is rotated continuously at approx. 1 rpm by a geared motor. The balls move relative to each other and to the perforated shell.



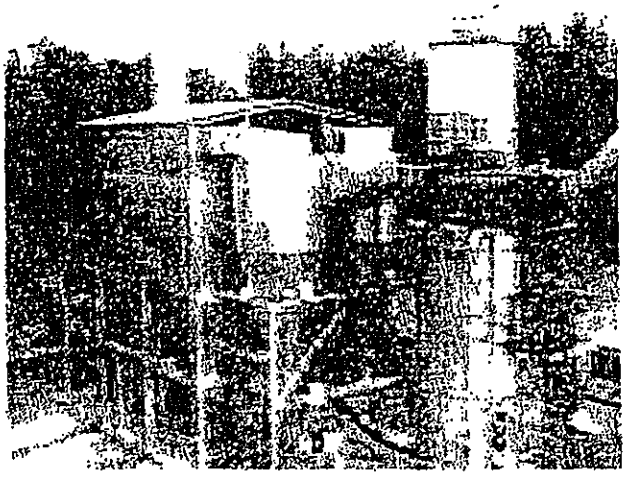
Conditioning rotor built into a reactor with flow direction change

Functions:

- Prevention of dust build up in conjunction with change of direction from downward to upward flow of dust laden gas in a duct or reactor.
- Break-up of large particle agglomerates with higher settling velocity than the upward gas velocity.
- Re-distribution of particles in the raw gas stream to achieve uniform concentration profile or mixing of incoming gas streams with different gas properties.

Application examples:

Dry sorption stage after municipal waste incinerator



Aluminium re-smelting furnace

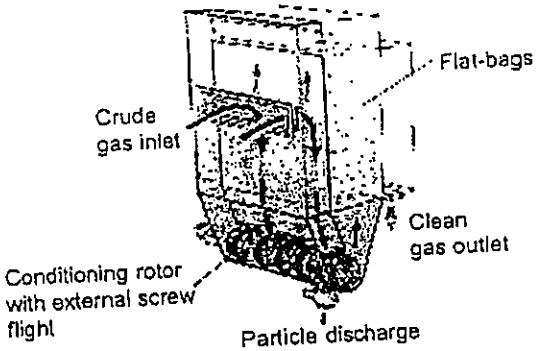
Conditioning Rotors (patented)

Design variants for Flat-Bag Filters - Application examples

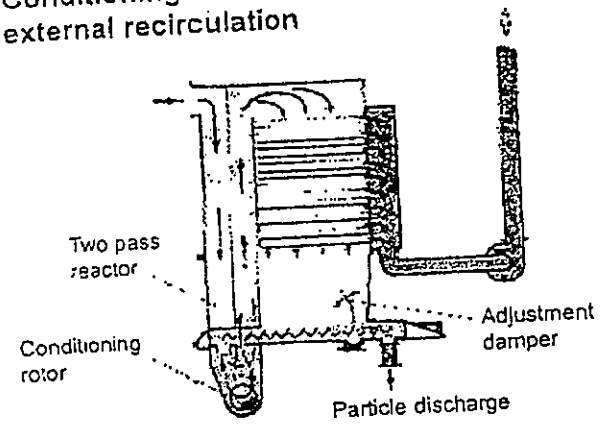
The ratio between the mass flow of primary particulate carried to the filter in the raw gas and the circulating mass flow in the conditioning rotor varies with type of control device.

Conditioning Rotor for dust recirculation - Internal circulation

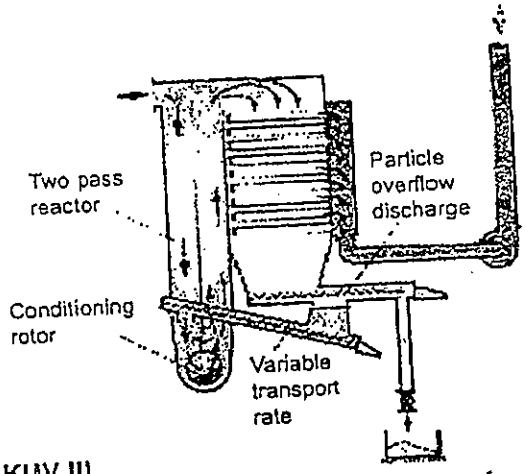
KRV
The ratio between the amount of discharged and recirculated particulate, respectively, can be varied by means of the velocity of the raw gas passing through the conditioning rotor.



Conditioning Rotor - Dust recycling with external recirculation



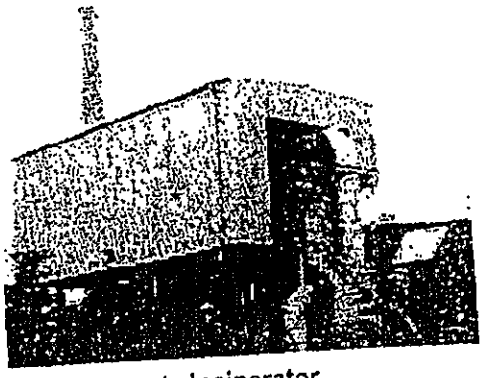
KUV I
The recycling ratio is set by means of an adjustment damper.



KUV III
The recycling ratio is adjustable by means of a recycling screw conveyor with varible capacity. The balance of the dust flow is discharged as purge product.

Both the Conditioning Rotor Recirculation and Recycling Processes ensure reliable recirculation of the collected particulate, without the use of pneumatic conveying methods.

Application examples:



Hospital waste Incinerator (KUV I)

Furnace for enamel and frit production (KUV III)

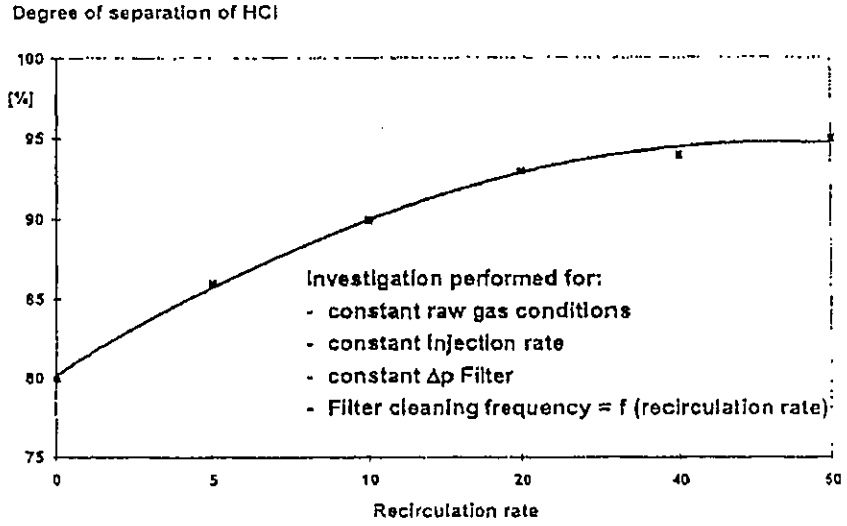
Conditioning Rotors (patented)

Chemisorption of gas components - in particular HF, HCl, SO_x - by injection of $Ca(OH)_2$

The high recycling rate of the absorbent, possible with the conditioning rotor, is proven to increase the efficiency of removing gaseous pollutants such as HF, HCl and SO_2 for a given absorbent injection rate. Alternatively, a given removal efficiency can be achieved at a reduced injection rate.

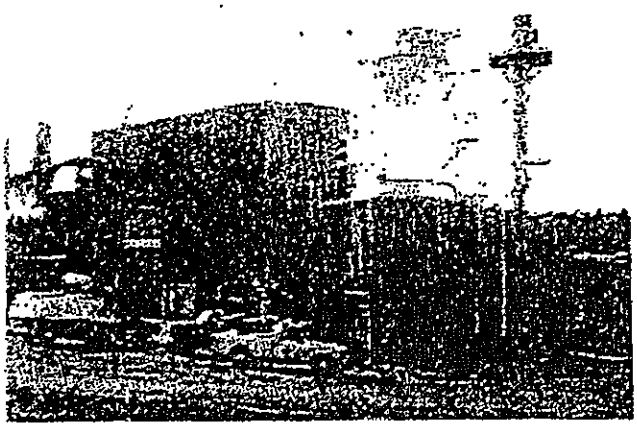
- *The total residence time of the absorbent in the system is increased.*
- *The concentration - contact area - of the absorbent in the reactor upstream of the filter is increased. (The residence time in the reactor may be longer than 2 sec.)*
- *New reaction sites for the absorption are created by the frequent recirculation and re-deposition of the filter cake on the bags.*

The graph shows an example of the variation in absorption efficiency with the re-circulation rate. It is evident that up to 50 recirculation cycles can be required in order to achieve optimum utilisation of the absorbent. If, for instance, the rate of injection of fresh absorbent is 100 kg/h, the recirculation rate would then be 5000 kg/h, corresponding to a volume flow rate of more than 10 m³/h.

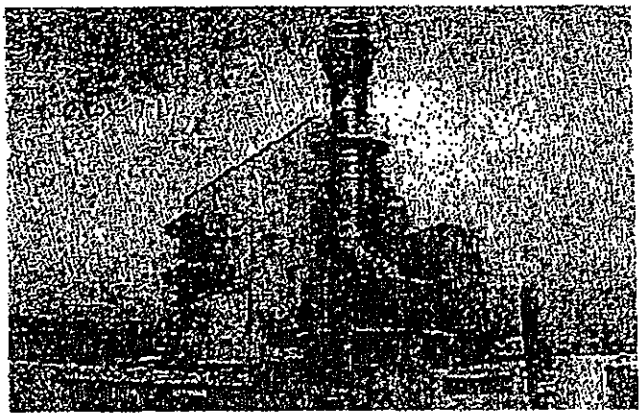


The LÜHR Conditioning Rotor Recycling Process enables reliable operation with high recirculation rates, also when difficult particulate such as $CaCl_2$ form a significant portion of the particulate in circulation! The mixing of the recycled particles in the raw gas stream is essentially homogeneous. Conveying with pneumatic methods, which is prone to frequent breakdown, is not used.

Application example:



Municipal waste incinerator

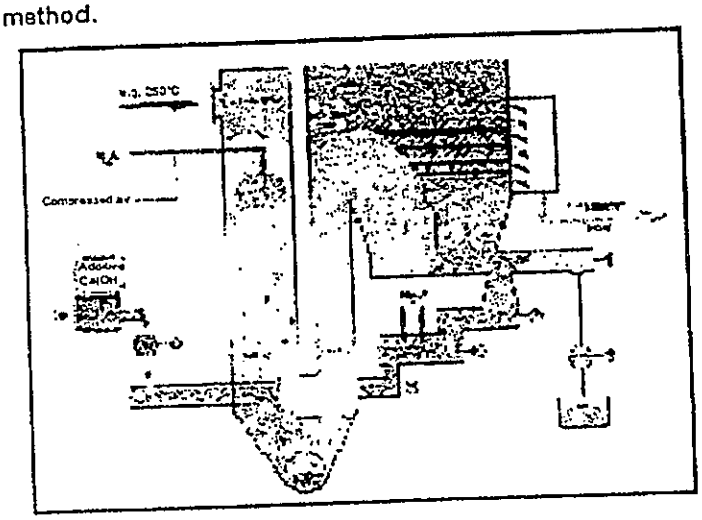


Aluminium re-smelting shop

Conditioning Rotors (patented)

Conditioned dry sorption

Very high absorption efficiency can be achieved with conditioning rotor and recycling for the chemisorption of acid gases, especially for HCl and SO_2, by injection of $Ca(OH)_2$ according to the conditioned dry absorption method.

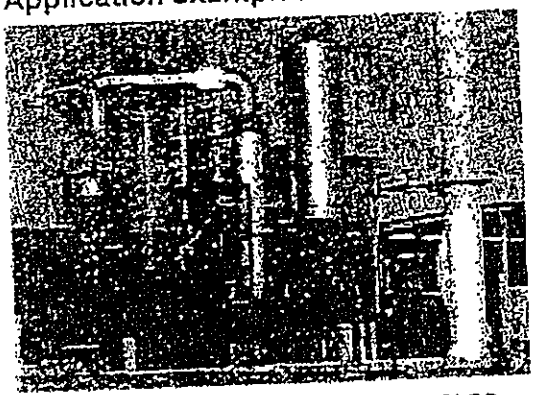


Conditioned dry absorption using the LÜHR Conditioning Rotor Recycle Process

- *Conditioning of the flue gas* by
  - evaporation of water introduced as very small droplets
  - increasing the absolute and relative humidity
  - operation at the temperature that is optimal for the reaction, whilst maintaining conditions for reliable process operation
- *Conditioning of the recycled particles* by metered injection of water into the recirculated particulate in a mixer upstream of the re-injection point into the flue gas flow at the conditioning rotor. The added moisture produces a marked improvement of the absorption conditions. It is essential for optimal result of the conditioning that the moistened particles are dispersed uniformly in the raw gas stream within a short distance from the point of injection.

The application of conditioned dry absorption by means of the Conditioning Rotor Recycle Process will in many cases achieve the required absorption efficiency with a single stage absorber, at low total cost. It has been demonstrated that statutory limits are consistently met for pollutant concentration in the clean gas, e.g. German standards for particle collection, absorption of acid gases and adsorption of dioxin and furan, as well as heavy metals such as mercury.

Application examples:



Particle collection, absorption of HF, HCl, SO_2, adsorption of PCDD/PCDF and heavy metals such as Hg in flue gas from burning of recycled timber

SO_2 sorption for exhaust gas from a tunnel kiln for bricks

Index

Remark: Please take technical data from the data sheets, motor data sheets, spare part lists as well as the circuit diagram which is made out by our electro-bureau. These documents are enclosed in case of an order.

1 Safety provissions for worker

The prescriptions "UVV" for continuous conveyor "VBG 10" and the safety instructions concerning the whole plant must be considered

Staff

- Assembly, commissioning, operation, maintenance and control works of the plant must be executed by qualified staff only. The management has to take care that unqualified persons are not admitted to the plant area.

Risk of injury

- Releasing or removal of protecting devices (assembly opening, sheazing of drive and end bearing) during operation are not permitted!
- Risk of squeezing
  - when aspiration hole is open
  - when drive is in operation - around coupling, bearing, shaft as well as revolution counter
- Risk of injury to eyes due to dust outlet - *Wear safety glasses!*
- After running of screw conveyor is possible even at switched off plant

In case of work at electric parts and other parts hot alive according to service conditions, the following instructions must be observed: In case of non-observance danger to life! :

- switch of plant by means of main switch and protect against restart!
  Fix warning board!
- control whether plant is without strain
- Prescriptions of the VDE as well as of VBG 4 (UVV 7.0) of BG must be strictly observed.

2 Transport

Transport as well as loading and unloading of the screw conveyors must be effected only by lifting cars or weight-carrying devices with sufficient carrying force.
In case of screw conveyors longer than 5 m, a transport safety device will be used.

3 Construction and function

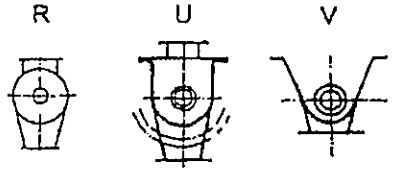
According to the application, tube and trough screw conveyors up to a lenght of 8 m and of a stable, solid construction with exterior shaft bearing are used.
Screw conveyors are used for transporting a material specified in the order confirmation. The material is conveyed through the rotating screw shaft with spirally arranged screw wings.
The drive is effected by a largely dimensioned gear motor with elastic coupling.
A protecting case is placed around all rotating machine parts.

For type designation and used type see spare part list

Example:

200 R
- R - Tube screw conveyor
  U,V - Trough screw conveyor
- diameter of screw conveyor wing ≙ lead of same

structural shape



Trough length : conventional design up to 6 m
reinforced design with a diameter of screw conveyor wing ≧ 250 mm : up to 8 m.

Lead : Tube screw conveyors up to a helix angle of max. 45° are used.

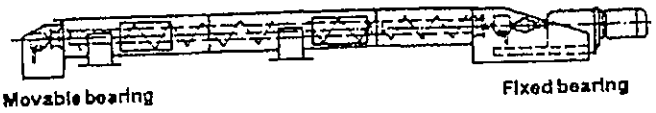
Bearing : Plummer block housing or flange bearing
Plummer block housing: diameter of screw conveyor wing 200, 250 = SN 610
315= SN 613

Flange bearing : FWS 60 U Sp.

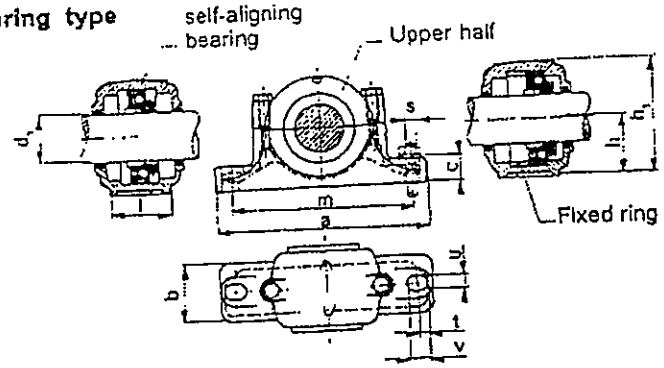
Attention **The actual execution of the screw conveyor can be seen from the spare part list!**

3.1 Plummer block housing

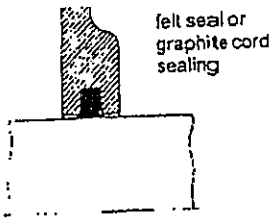
Erection view



Bearing type



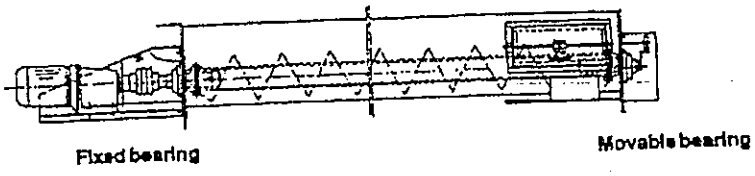
Seal



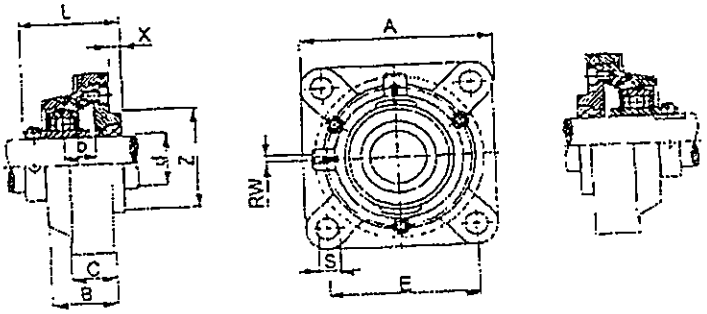
Reference of Housing without bearing	Weight kg	Dimensions in mm											S		Reference of bearings and sleeve	Locating rings	
		d_1	h	h_1	l	e	b	c	m	u	v	t	mm	inch		Reference	Weight a.p. 9
SN 610	4,7	45	70	135	115	255	70	30	210	18	23	11,5	M 16	5/8	2310K + H 2310	1 x FR 10/110	90
SN 613	8,7	60	95	175	130	315	90	32	260	22	28	14	M 20	3/4	2313K + H 2313	1 x FR 10/140	100

3.2 Flange bearing

Erection view



Bearing type



Reference insert UC 200	Weight without insert in kg	Dimensions in mm										Reference insert UC 200	Weight in kg
		d	A	E	S	B	C	b	L	Z	X		
FWS 60 U Sp.	4,73	60	175	143	17	52	19	28,4	84,5	145	14,5	UC 212	1,47

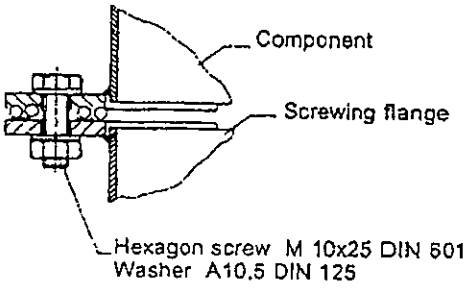
4 Assembly

4.1 Assembly of the component

Assembly of the screw conveyors must be executed by qualified staff only.
The manufacturing company does not take over any liability for incorrect assembly.

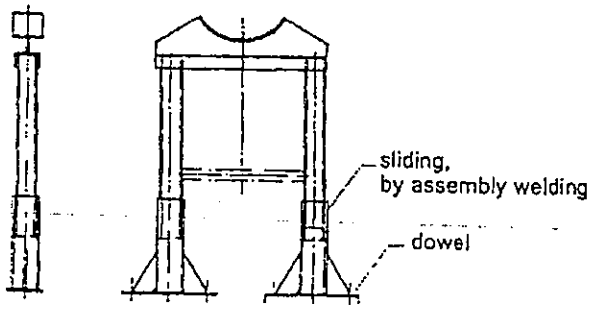
The screw conveyors is delivered completely assembled and screwed up with the corresponding component part, in case of trough screw conveyors by means of a flange, in case of tube screw conveyors at the inlet opening.
Flange sealing !
Apply special glue onto flange area,
push on glass fibre cord and putty cord tightly.
Screw on flange tightly.

- Putty cord
- Glass fibre cord



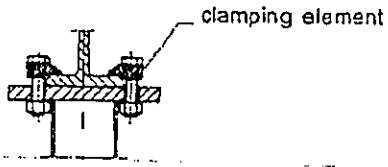
4.2 Assembly screw conveyor support and suspension (if existing)

Example Screw conveyor support



The position of the screw conveyor support can be seen from the layout, the screwings from the corresponding documentation.

Screw conveyor suspension



The suspension is fixed to supports e.g. by clamping elements.

4.3 Elektric assembly

- **Connection of components** is to be effected according to terminal diagram
- **Drive** - see name plate or packed up sheet of the motor manufacturer
- Remote indication of the position of the **revolution counter** and eventually existing intermediate terminal boxes can be seen from the electric documentation.

5 Commissioning

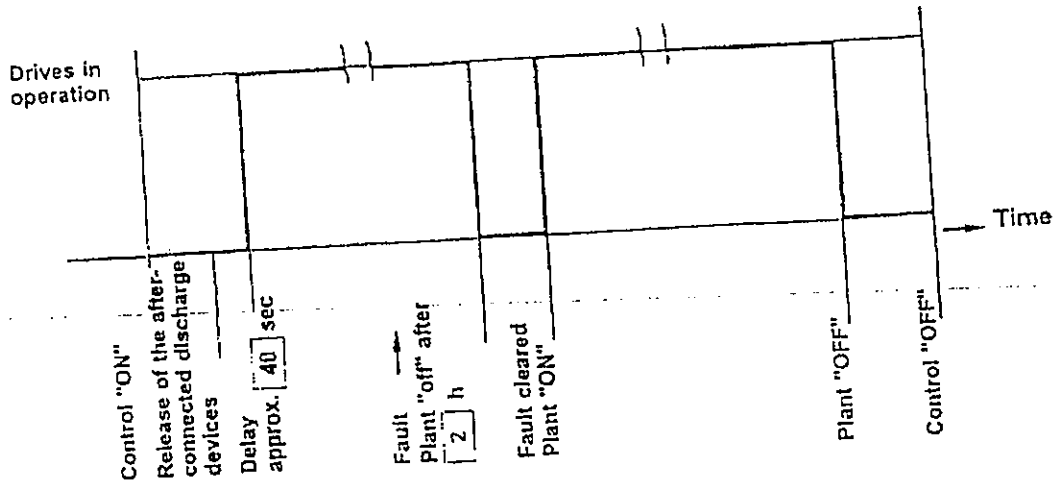
Prior to commissioning of the flap, the following must be controlled:

- assembly according to the Operating Instructions
- no foreign substance (e.g. assembly residues)
- close installation of electrical connections, tightness of cable inlets and adjustment of the protective device to motor nominal current (see name-plate)
- rotating sense of motor
- tight fit and sensing range of the rotation controller (if equiped with)
- guarantee the following discharge devices or transport systems a regular material flow

Attention **Prior to commissioning of the screw conveyor, a test run must be effected**

6 Operation

6.1 Process scheme screw conveyor



Attention Observe sequence control of dust discharge devices connected in series i.e. when the last placed unit in dust flow direction stopped, all the other discharge devices must also have stopped.

Attention **During screw conveyor operation contrary to the sense of rotation risks of stoppages, dust fires ect. are possible.**

6.2 Interruptions

Interruptions must be eliminated immediately !

Interruption	Possible cause	Measure
Conveyor does not operate	- electrical failure	- check connecting cable - see additional Operating Instructions of motor manufacturer - check distribution
	- over-charge	- check outlet (back draught) - check inlet (dosage)
	- impurities in the screw trough	- control, eliminate, if necessary
Conveyor in operation, but does not transport	- no inlet of material	- check function of pre-connected conveyors
	- bridging	- eliminate bridge
	- material is spinned by the conveyor	- clean conveyor
	- incorrect rotating sense of screw	- check, change, if necessary
	- break of conveying element	- repair

7 Maintenance and upkeep

7.1 General instructions

Before and after maintenance / repair work, the following instructions must be observed:

- **Before maintenance / repair work:**
  - **For all work, the screw conveyor must be without strain !**
  - **it must be protected against unauthorized restart !**
  - **In addition, the Operating instructions of the motor manufacturer must be observed !**

- **After termination of maintenance / repair work:**
  - **All protective devices (assembly opening) must be orderly mounted and tightly screwed.**
  - **Consider instructions of point "Commissioning" !**

Only then commissioning can be effected.

7.2 Maintenance list

The screw conveyor must by regularly serviced. Insufficient and incorrect maintenance will result in operating failures !

The following components must be controlled and serviced in regular intervals :

Component	Maintenance interval / control
- Motor	see instructions of manufacturer lubrication instructions
- Coupling	every three mounths wear
- Bearing - Plummer block Flange bearing	every three mounths running noises, wear
- Screw shaft	every three mounths check functioning, (e.g. wear)
- Speed controlling	every three mounths function control

7.3 Plummer blocks

According to Lühr standard the plummer blocks of the screw conveyors are maintenance free.

Once prior to installation the ball bearings are provided with a grease filling. Under normal conditions, i.e. low number of revolutions (30-70 rpm) and ambient temperature (20-60°C), re-greasing is not necessary.

In case re-greasing is required, it is easily possible by observing the following aspects:
- The upper half of the plummer block casing has to be screwed off.
- The old grease has to be removed from the casing chamber and the self-aligning bearing.
- movable bearing: The ball bearings for the floating bearing must be located exaxtly in the centre of the bearing seating bore.
  Fixed bearing: Axial guiding of the machine component to be supported in plummer block housings is provided by the insertion of location rings between the outer ring and the housing collar.
  If one only location ring is applied, always insert it at the side of the adaptor sleeve nut.
- New grease has to be refilled, i.e. the hollow spaces of the self-aligning bearing have to be spread totally with grease.
- Please keep a careful check on the slackness during the mounting of the bearing.
- After having provided the bearing with the required type and quantity of grease (please refer to Maintenance Instructions), install the top of the housing and screw tightly.

7.4 Flange bearing

Mounted units are filled with a special corrision resistant and nonageing high grade grease, so that under normal operating conditions no subsequent lubrication is required.

Control : The rotary airlock valves have to be controlled at regular intervals concerning wear and deposits.

Wear : The installed Viton lip seals at the bucket wheel are wear parts and have to be replaced after signs of wear (leakage)!

Attention! Danger of squeezing !
Never reach into the running bucket wheel!
In case of repair works the valve has to be out of action and has to be protected against unauthorised restart!

1 Safety instructions

The safety instructions of the whole plant must be observed.

When working at the additive injection system the regulations of VBG 112 concerning the prevention of injury risk must be observed strictly.

White hydrated lime is corrosive and can be classified according 91/155/EWG and § 14-GefStoffV. Protective clothing, mouth protection, protective glasses and gloves are prescribed.

Staff

- Installation, commissioning, operation and maintenance as well as controls of the plant must be carried out only by qualified staff. The management has to ensure that non-qualified staff are prohibited from the plant operating area.

Operation

- The plant should be controlled by regular control rounds. Occuring defects, damages and functional disturbances must be removed without delay.
- It is advisable to keep a record of shifts in order to note all events, such as disturbances and maintenance works.
- Detachment or removal of protective devices resp. opening of access or inspection doors should not be carried out whilst the plant is in operation.

Injury Risk

- Warning and safety signs must be observed whilst inspection of plant.
- When working above body-height, corresponding devices or other safety ascending devices or maintenance platforms must be used. Machine parts may not be used as ascending device.
  During maintenance works in great height wear safety belt.
- Control or repair of plant after overheating or fire must only be carried out using the correct form of breathing apparatus and/or by sufficient ventilation of the working area.

During maintenance the corresponding safety instructions must be observed!

1.1 Additive powder injection device

In case of plants which are driven in one-shift operation, the additve powder injection is effected as shift portion (approx. 3 kg/shift) during the warm-up operation of cremation.
In case of plants driven in multi-shift operation, the injection is also effected in shift portions but in 8h cycles during the plant operation.

The injection is effected as follows:

The additive powder is provided in barrels. The respective barrel is placed on a balance near the reactor.
After opening of barrel cover the discharge is effected by means of suction lifter and available negative pressure (vacuum cleaner principle) via conveying hose to reactor.
The intake process is controlled by means of a pneumatically operated shut-off flap with limit switch, situated at reactor inlet.
Optical control of the discharge quantity is provided by a digital display at the balance.

1.2 Maintenance list

Attention — Due to the fact that wear and deposits depend on various influences, the control intervals have to be adapted to the local conditions!

The following components have to be controlled or maintained:

Component	Maintenance interval/ Control
Conveying hose	every 3 months (at least) - brush off conveying hose starting from pneum. shut-off flap in direction to aspiration port (barrel) in order to avoid deposits
Pneumatical shut-off flap	every 3 months (at least) - shut-off flap (observe control instructions Jaudt!)

APPENDIX H
Malfunction / Breakdown Record Sheet

Malfunction/Breakdown Record

To: The Authority

Notice is hereby given that during the period of _____ to _____, A malfunction or breakdown of air pollution control equipment or process equipment, which may result in an abnormal air pollutant emission, has occurred. Details of the specified process and the incident are as follows:-

1. Name and address of the premises where the specified process is conducted:

2. Licence No.:

3. Date and time when the incident occurred:

4. Equipment concerned:

5. Emission point(s) concerned (if applicable):

6. Production/processing rate during the incident:

7. Nature of malfunction or breakdown:

8. Emission rate(s) and concentration(s) or air pollutant(s) during the incident, if known:

9. Action taken to stop the abnormal emission:

10. Action taken to prevent similar incident occurring again:

11. Name and telephone no. of the contact person:

I certify that the above statements are correct to the best of my knowledge and belief.

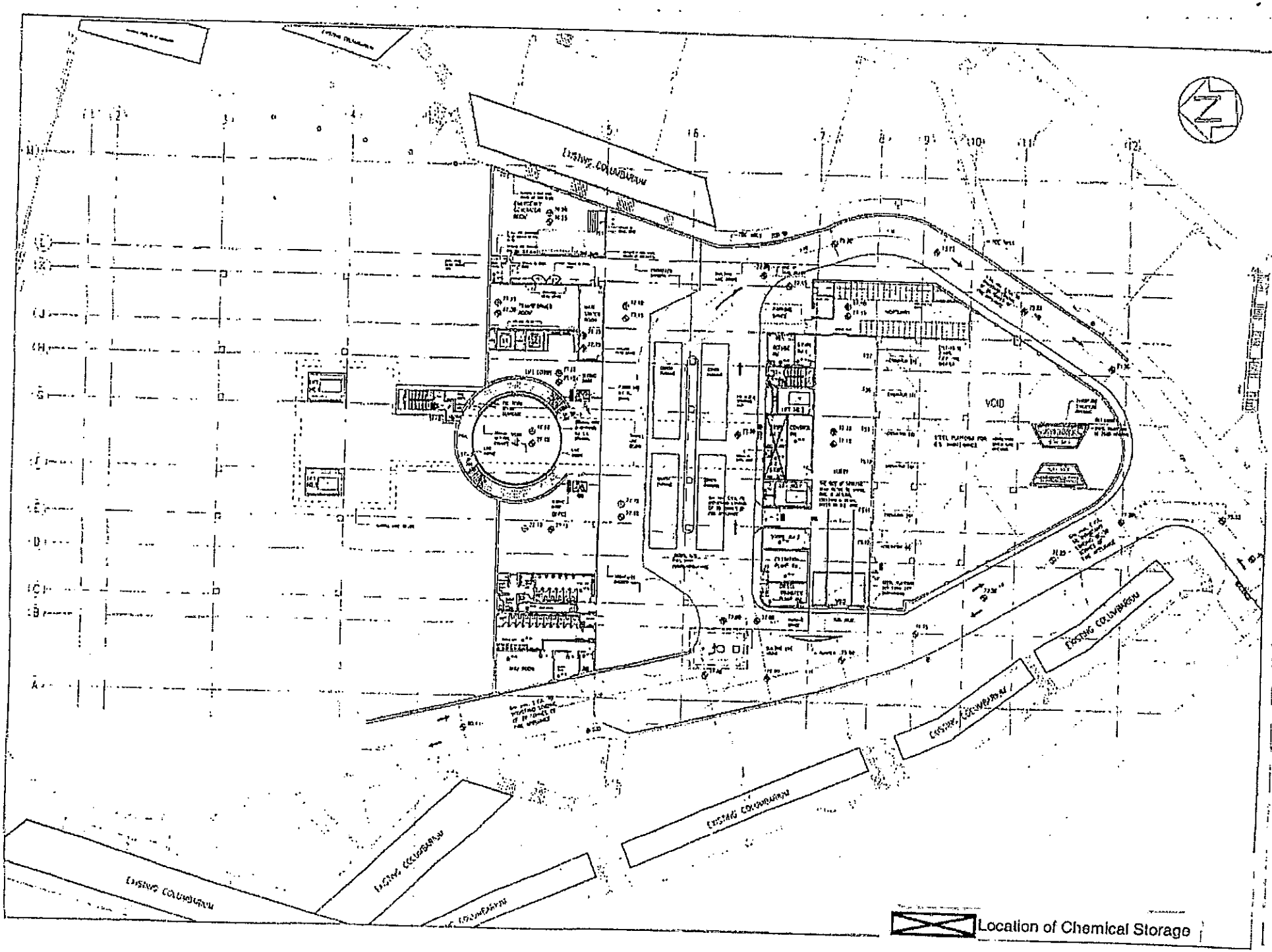
Signature : _____

Name : _____

Position : _____

Date : _____

APPENDIX I
Location of Chemical Storage


VOID
Location of Chemical Storage

APPENDIX J
Implementation Schedule for Commissioning and Operation of the New Cremators

Appendix J Implementation Schedule for Commissioning and Operation of the New Cremators

EIA ref.	Environmental Protection Measures/Mitigation Measures	Location/Timing	Implementation Agent and Stages	Implementation Stages				Relevant Legislation and Guidelines
				Con	Com	Dem	Ope	
Air (Construction)								
S.4.3.8	Special air pollution control systems should operate to reduce the emissions of air pollutants to acceptable levels	New cremators in New Crematorium / all stages	FEHD				*	BPM/APCO
S.4.2.5	Specified Process License (under the APCO) is under application by FEHD	New Cremators in the New Crematorium / prior to operation	FEHD		*			APCO
S.4.6.2	Sufficient water spraying should be applied during the construction work, the fugitive dust generated from general construction dust would be reduced by 90%	Project site	Contractor	*				APCO
S.4.6.46	If the dioxin level of surface deposition is between 1 and 10 ppb I-TEQ, it is classified as moderately contaminated with dioxins. The demolition work site should be covered up to avoid emission of fugitive dust during demolition	Demolition existing crematorium facilities (PhaseII)	Arch SD(Phase II)			*		
S.4.6.47	If the dioxin level of surface deposition exceeds 10 ppb I-TEQ, it is classified as severely dioxin-contaminated waste. If it is confirmed that the existing facilities are severely contaminated with dioxins, a special decommissioning method – Containment method – would be adopted	Demolition existing crematorium facilities (PhaseII)	Arch SD(Phase II)			*		
S.4.7.2	Erect a site barrier with the height of no less than 2.4 m to enclose the construction site		Contractor	*				APCO, Air Pollution Control (Construction Dust) Regulation
	Apply frequent water spraying to ensure the surface of the construction site sufficiently wet to reduce fugitive dust due to wind erosion and transportation on unpaved haul road							

EIA ref.	Environmental Protection Measures/Mitigation Measures	Location/Timing	Implementation Agent and Stages	Implementation Stages				Relevant Legislation and Guidelines
				Con	Com	Dem	Ope	
	Cover up stockpiles of fill material and dusty material							
	Install a vehicle-cleaning system at the main entrance of the construction site to clean up the vehicles before leaving the site							
	The Air Pollution Control (Construction Dust) Regulation shall be followed for fugitive dust control							
Air (Testing and Commissioning)								
S.4.7.4 & S.4.7.5	No more than 6 cremators (including both the existing and new ones) are in operation during commissioning test of new cremators. The commissioning test of each new cremator should be recorded by a log book	Existing and new cremators in Exiting and New Crematorium / text and commissioning	Arch SD / FEHD / Contractor		*			
S.4.5.9	Managerial arrangement should be made that no more than six cremators in operation at any time (including both existing and new cremators) during testing and commissioning period	New cremators in New Crematorium / testing and commissioning	FEHD		*			
Air (Operation)								
S.4.6.7	Training on operation of the cremator system would be provided to the responsible staff, to ensure proper operation of the system	New Cremators in New Crematorium / testing and commissioning	Arch SD / Contractor		*			BPM/APCO
S.4.6.7	Air pollution control system and monitoring equipment would be tested and evaluated during testing and commissioning stage	New Cremators in New Crematorium / testing and commissioning	Arch SD / Contractor		*			BPM/APCO
S.4.6.28	FEHD would implement stringent managerial programme to ensure proper operation and to	New Cremators in New	FEHD				*	BPM/APCO

EIA ref.	Environmental Protection Measures/Mitigation Measures	Location/Timing	Implementation Agent and Stages	Implementation Stages				Relevant Legislation and Guidelines
				Con	Com	Dem	Ope	
	provide adequate maintenance to the cremators in order to avoid emission of nuisance odour	Crematorium / operation						
S.4.6.29	FEHD would carry out regular odour patrol at the site boundary during the operation of the new Crematorium. Corrective actions will be carried out immediately if significant odour emission is detected by the odour patrol team	New Cremators in New Crematorium / operation	FEHD				*	BPM/APCO
S.4.6.32	FEHD will limit the use of joss paper burners. Joss paper burners will be only allowed for the use of memorial ceremonies upon requested by the relatives. Other usage of joss paper burners will not be allowed	Joss burners in New Crematorium / operation	FEHD				*	BPM/APCO
S.4.6.32	Guidance will be provided to users of joss paper burners to advise them to minimize the quantity of burning material	Joss burner in New Crematorium / operation	FEHD				*	BPM/APCO
S.4.6.32	FEHD staff will advise users of joss paper burners to ensure better combustion of joss paper to reduce smoke emission	Joss burner in New Crematorium / operation	FEHD				*	BPM/APCO
S.4.5.2	For ensuring proper operation of the Crematorium and the air pollution control system, in case of any significant part of the cremator system that would induce severe pollution problems, FEHD staff would on advice of EMSD suspend the operation and rectify the failure as soon as possible.	Cremators in New Crematorium / operation	FEHD / EMSD				*	BPM/APCO
Air	(EM&A for Operation)							
S.11.3.2	Conduct continuous monitoring for the following pollutants and processes: • Temperature inside the primary combustion zone; • Temperature at the outlet from the	Cremators and chimney of the New Crematorium / operation	FEHD				*	APCO, BPM 12/2, future Specified Process Licence

EIA ref.	Environmental Protection Measures/Mitigation Measures	Location/Timing	Implementation Agent and Stages	Implementation Stages				Relevant Legislation and Guidelines
				Con	Com	Dem	Ope	
	secondary combustion zone; • Oxygen concentration at the outlet from the secondary combustion zone; • Carbon Monoxide concentration at the outlet from the secondary combustion zone; • Smoke density at the chimney of the cremator; and • Other essential operating parameter(s) which may affect the performance of air pollution control measures.							
S.11.3.10	Conduct regular monitoring for stack emissions as per the requirements of future Specified Process License to be issued by EPD.	Chimney of the New Crematorium / operation	FEHD				*	APCO, BPM 12/2, future Specified Process Licence
Noise(Construction)								
S.5.3.9	Select quiet plant, which is defined as PME with a sound power level lower than that specified in GW-TM. Examples of quiet plant can be referred to those listed in British Standard BS5228.	Project site	Contractor	*		*		GW-TM
S.5.3.11 & S.5.3.12	Where practicable, use movable barriers of 3 to 5 m height with a small cantilevered upper portion and skid footing can be located within a few metres from a stationary plant (e.g. generator, compressor, etc.) and within about 5 m for a mobile equipment (e.g. breaker, excavator, etc.), especially in the vicinity of SR3, SR4 and SR6. The purpose-built noise barriers or screens shall be constructed of appropriate materials with a minimum superficial density of 15kg/m^2.		Contractor	*		*		NCO
S.5.3.13	• Only well-maintained plant should be operated on site and plant should be	Project site	Contractor	*		*		NCO

EIA ref.	Environmental Protection Measures/Mitigation Measures	Location/Timing	Implementation Agent and Stages	Implementation Stages				Relevant Legislation and Guidelines
				Con	Com	Dem	Ope	
	regularly serviced during the construction works • Plant that is used intermittently should be turned off or throttled down when not in active use • Plant that is known to emit noise strongly in one direction should be oriented to face away from NSRs • Silencers, mufflers and enclosures for plant should be used where possible and maintained adequately throughout the works • Where possible mobile plant should be sited away from NSRs • Stockpiles of excavated materials and other structures such as site buildings should be used effectively to screen noise from the works							
S.5.3.15 (iii)	Liaise with the school and the Examination Authority to ascertain the dates and times of examination periods during the course of the construction works so as to avoid any noisy activities during these periods. Programme of the on-site works should hence be well programmed such that the noisier construction activities would not be coincided with the examination of the schools.	Project site	Contractor	*		*		NCO
Noise(Operation)								
S.5.4.7	The quantities and the maximum sound power level of the fixed plants should not exceed the plant inventory information given by the project proponent as assessed in the EIA report.. In general, noise from the operation of the concerned fixed-noise sources can be reduced by	All fixed-noise sources in New Crematorium / design and operation stages	Arch SD, Contractor FEHD	*			 *	NCO

EIA ref.	Environmental Protection Measures/Mitigation Measures	Location/Timing	Implementation Agent and Stages	Implementation Stages				Relevant Legislation and Guidelines
				Con	Com	Dem	Ope	
	locating it as far as practical from the NSRs, and/ or by orientating the noise emission points (e.g. discharge points of ventilation etc.) away from the NSRs, and/ or by implementation of silencers and acoustic barriers to the concerned system.							
Waste Management (Construction)								
S.7.7.1	Good Site Practice • Obtain relevant waste disposal permits from the appropriate authorities, in accordance with the Waste Disposal Ordinance (Cap. 354), Waste Disposal (Chemical Waste) (General) Regulation (Cap. 354) and the Land (Miscellaneous Provision) Ordinance (Cap. 28) • Prepare a Waste Management Plan approved by the Engineers / Supervising Officer of the Project in accordance with Environment, Transport and Works Bureau Technical Circular (Works) (ETWBTC(W)) 15/2003, Waste Management On Construction Sites • Nominate an approved person, such as site manager, to be responsible for good site practice, arrangements for collection and effective disposal of all types of wastes generated on-site to appropriate facility • Use waste haulier authorized or licensed to collect specific category of waste • Establish trip ticket system as contractual requirement (with reference to Works Branch Technical Circular (WBTC) No. 21/2002) for monitoring of public fill and C&D waste at public filling facilities and landfills. Such activities should be	Project site	Contractor	*		*		Waste Disposal Ordinance (Cap. 354), Waste Disposal (Chemical Waste) (General) Regulation (Cap. 354) Land (Miscellaneous Provision) Ordinance (Cap. 28) WDO, ETWBTC(W) 15/2003, WBTC No. 21/2002

EIA ref.	Environmental Protection Measures/Mitigation Measures	Location/Timing	Implementation Agent and Stages	Implementation Stages				Relevant Legislation and Guidelines
				Con	Com	Dem	Ope	
	monitored by the Environmental Team • Provide training to site staff in terms of proper waste management and chemical waste handling procedures • Separate chemical wastes for special handling and dispose them at licensed facility for treatment • Establish routine cleaning and maintenance programme for drainage systems, sumps and oil interceptors • Provide sufficient waste disposal points and regular collection for disposal • Adopt measures to minimize windblown litter and dust during transportation of waste, such as covering trucks or transporting wastes in enclosed containers • Establish recording system for the amount of wastes generated, recycled and disposed of (including the disposal sites)							
S.7.7.2	<u>Waste Management Plan</u> The contractor should submit the Waste Management Plan to Engineer/Supervising Officer of the Project for approval. The Waste Management Plan should describe the arrangements for avoidance, reuse, recovery and recycling, storage, collection, treatment and disposal of different categories of waste to be generated from the activities of the Project and indicate the disposal location(s) of all waste. A trip ticket system should be included in the Waste Management Plan.	Project site	Contractor	*		*		Waste Disposal Ordinance (Cap. 354)
S.7.7.3	<u>Waste Reduction Measures</u> • Minimize the damage or contamination of	Project site	Contractor	*		*		WBTC No. 32/92, 5/98 and

EIA ref.	Environmental Protection Measures/Mitigation Measures	Location/Timing	Implementation Agent and Stages	Implementation Stages				Relevant Legislation and Guidelines
				Con	Com	Dem	Ope	
	construction material by proper storage and site practices • Plan and stock construction materials carefully to minimize amount of waste generated and avoid unnecessary generation of waste • Prior to disposal of C&D waste, wood, steel and other metals should be separated for reuse and / or recycling to minimize the quantity of waste to be disposed of to landfill • Minimize use of wood and reuse non-timber formwork to reduce the amount of C&D waste • Recycle any unused chemicals or those with remaining functional capacity as far as practicable • As far as practicable, segregate and store different types of waste in different containers, skips or stockpiles to enhance reuse or recycling of materials and their proper disposal • Encourage collection of aluminium cans, plastic bottles and packaging material (e.g. carton boxes) and office paper by individual collectors, separate labeled bins should be provided to help segregate this waste from other general refuse generated by the work force							19/99
S.7.7.5	<u>Excavated Material</u> Rock and soil generated from excavation should be reused for site formation as far as possible. In addition, excavated material from foundation work can be reused for landscaping as	Project site	Contractor	*		*		WBTC 12/2000

EIA ref.	Environmental Protection Measures/Mitigation Measures	Location/Timing	Implementation Agent and Stages	Implementation Stages				Relevant Legislation and Guidelines
				Con	Com	Dem	Ope	
	far as practicable to avoid disposal off-site.							
S.7.7.6 – S.7.7.8	Construction Material Careful design, planning and good site management can minimize over-ordering and generation of waste materials such as concrete, mortar and cement grouts. Standard formwork should be used as far as practicable, wooden formwork should be replaced by metal ones whenever possible. Alternatives such as plastic fencing and reusable site office structures can also minimize C&D waste generation.	Project site	Contractor	*				WBTC 5/98 and 19/99
	The contractor should recycle as much as possible of the C&D material on-site. Public fill and C&D waste should be segregated and stored in different containers or skips to enhance reuse or recycling of materials and their proper disposal. Materials such as concrete and masonry can be crushed and used as fill and steel reinforcing bar can be used by scrap steel mills. Different areas of sites should be designated for such segregation and storage.	Project site	Contractor	*				
	To maximize landfill life, government policy discourages the disposal of C&D materials with more than 20% inert material by volume (or 30% inert material by weight) at landfill. Inert C&D material (public fill) should be directed to an approved public filling area, where it has the added benefit of offsetting the need for removal of materials from borrow areas for reclamation purposes.	Project site	Contractor	*				
	A land contamination site investigation was carried out under this EIA to determine disposal requirements for contaminated soil. Further site	Locations S1 to S6 in CAP / prior to Phase II	Contractor			*		

EIA ref.	Environmental Protection Measures/Mitigation Measures	Location/Timing	Implementation Agent and Stages	Implementation Stages				Relevant Legislation and Guidelines
				Con	Com	Dem	Ope	
	investigation on soil around CLP secondary substation was carried out during Phase I of the works. In addition, confirmatory testing on DCM level in locations S1 to S6 will be required to identify the appropriate remediation and disposal requirements during Phase II of the works.	demolition						
S.7.7.22-S.7.7.24	Dioxin Containing Materials (DCM) / Heavy Metal Containing Materials (HMCM) /Polyaromatic Hydrocarbon Containing Materials (PAHCM) / Total Petroleum Hydrocarbon Containing Materials (TPHCM) / Polychlorinated Biphenyls Containing Materials (PCBCM) from Soil Remediation at the Project Site	Phase II	Contractor					ProPECC PN3/94
	Confirmatory test on levels of DCM, HMCM and PAHCM in locations S1 to S6 during Phase II of the works is also required to determine any further remediation /treatment/disposal. In addition, the ash waste in cremator/chimney/flues should also be collected for the testing of DCM/HMCM/PAHCM during Phase II of the works. The sampling and analysis plan should be prepared and submitted to EPD for approval.	Phase II	Contractor			*		ProPECC PN3/94
	All the aforementioned ACM / DCM / HMCM / PAHCM / TPHCM / PCBCM are classified as chemical waste. In addition to the measures mentioned above, the packaging, labelling and storage practices of chemical waste as stipulated in the following paragraphs should also be applied to these contaminated materials.	Project site / demolition	Contractor			*		Waste Disposal (Chemical Waste) (General) Regulation
S.7.7.25-S.7.7.27	Chemical Waste All the chemical waste should be handled	Project site	Contractor FEHD	*				Code of Practice on the Packaging;

EIA ref.	Environmental Protection Measures/Mitigation Measures	Location/Timing	Implementation Agent and Stages	Implementation Stages				Relevant Legislation and Guidelines
				Con	Com	Dem	Ope	
	according to the *Code of Practice on the Packaging, Labelling and Storage of Chemical Wastes*. The Contractor / Operator should register as a chemical waste producer. The chemical waste should be stored and collected by an approved contractor for disposal at a licensed facility in accordance with the *Waste Disposal (Chemical Waste) (General) Regulation*. Containers used for the storage of chemical waste should:						*	Labelling and Storage of Chemical Wastes. Waste Disposal (Chemical Waste) (General) Regulation.
	• Be suitable for the substance they are holding, resistant to corrosion, maintained in good condition, and securely closed; • Have a capacity of less than 450 L unless the specifications have been approved by the EPD; and • Display a label in English and Chinese in accordance with instructions prescribed in *Schedule 2* of the *Waste Disposal (Chemical Waste) (General) Regulation.*	Project site	Contractor FEHD	*			*	
	The storage area for chemical waste should: • Be clearly labeled and used solely for the storage of chemical waste; • Be enclosed on at least 3 sides; • Have an impermeable floor and bunding, of capacity to accommodate 110% of the volume of the largest container or 20% by volume of the chemical waste stored in that area, whichever is the greatest; • Have adequate ventilation; • Be covered to prevent rainfall from entering (water collected within the bund must be tested and disposal as chemical waste if	Project site	Contractor FEHD	*			*	

EIA ref.	Environmental Protection Measures/Mitigation Measures	Location/Timing	Implementation Agent and Stages	Implementation Stages				Relevant Legislation and Guidelines
				Con	Com	Dem	Ope	
	necessary); and • Be properly arranged so that incompatible materials are adequately separated.							
	The chemical waste should be disposed of by: • A licensed waste collector; • A facility licensed to receive chemical waste, such as the CWTC at Tsing Yi, which offers chemical waste collection service and can supply the necessary storage containers; and/or • A waste recycling plant as approved by EPD.	Project site	Contractor FEHD	*			*	Code of Practice on the Packaging, Labelling and Storage of Chemical Wastes. Waste Disposal (Chemical Waste) (General) Regulation.
S.7.7.28-S.7.7.29	<u>General Refuse</u> General refuse should be stored in enclosed bins or compaction units separated from C&D and chemical wastes. A reliable waste collector should be employed by the contractor to remove general refuse from the site, separately from C&D and chemical wastes, on a daily or every second day basis to minimize odour, pest and litter impacts. The burning of refuse on construction sites is prohibited by law. Aluminum cans are often recovered from the waste stream by individual collectors if they are segregated or easily accessible. Therefore, separately labeled bins for deposit of these cans should be provided if feasible. Similarly, plastic bottles and carton package material generated on-site should be separated for recycling as far as	Project site	Contractor FEHD	*			*	

EIA ref.	Environmental Protection Measures/Mitigation Measures	Location/Timing	Implementation Agent and Stages	Implementation Stages				Relevant Legislation and Guidelines
				Con	Com	Dem	Ope	
	practicable. Site office waste should be reduced through recycling of paper if volumes are large enough to warrant collection. Participation in a local collection scheme should be considered if one is available.							
Waste Management (Operation)								
S.7.8.1	<u>Ash and Non-combustible Residues</u> The disposal of bone ash and non-combustible residues should be properly collected and handled to avoid dust emissions. In line with the current practices, the bone ash should be stored in ash bags with robust inner plastic bags for collection by the deceased's relatives within 2 months upon appointment while the non-combustible residues should be collected in sealed heavy-duty polyethene bags for disposal at landfill.	New Crematorium / operation	FEHD				*	
S.7.8.2-S.7.8.3	<u>Chemical Waste</u> The operator should register as chemical waste producer. The chemical wastes generated from the air pollution control system would mainly include used activated carbon and un-reacted lime and collected particulate matter. To prevent health hazards to operators, all such chemical wastes should be carefully collected and handled to avoid dust emissions. All the chemical wastes generated from the air pollution control system as well as from machinery maintenance and servicing should be dealt with according to the *Code of Practice on the Packaging, Labelling and Storage of Chemical Wastes* under the provisions of the	New Crematorium / operation	FEHD				*	Code of Practice on the Packaging, Labelling and Storage of Chemical Wastes. Waste Disposal (Chemical Waste) (General) Regulation.

EIA ref.	Environmental Protection Measures/Mitigation Measures	Location/Timing	Implementation Agent and Stages	Implementation Stages				Relevant Legislation and Guidelines
				Con	Com	Dem	Ope	
	Waste Disposal (Chemical Waste)(General) Regulation. The chemical wastes should be collected by drum-type containers and removed by a licensed chemical waste contractor. In addition, the relevant measures as provided in S.7.7.22-S.7.7.24 should be followed.							
S.7.8.4-S.7.8.6	<u>General Refuse</u> Waste generated in offices should be reduced through segregation and collection of recyclable waste materials (such as paper and carton packages) if the volumes are large enough to warrant collection. Participation in a local collection scheme should be considered if one is available. To promote recycling of waste paper, aluminum cans and plastic bottles by the visitors, it is recommended to place clearly labeled recycling bins (such as those available from EPD) at convenient locations within the New Crematorium area. The recyclable waste materials should then be collected by reliable waste recycling agents on a regular basis. The general refuse (other than those segregated recyclable wastes) should be separated from any chemical wastes and stored in covered waste skips. FEHD should remove general refuse from the site, separately from chemical wastes, on daily basis to minimize odour, pest and litter impacts. Burning of refuse must be strictly prohibited.	New Crematorium / operation	FEHD				*	
Landscape and Visual Impact Assessment								

EIA ref.	Environmental Protection Measures/Mitigation Measures	Location/Timing	Implementation Agent and Stages	Implementation Stages				Relevant Legislation and Guidelines
				Con	Com	Dem	Ope	
S.8.1.21	The identification of the landscape and visual impacts should highlight those sources of conflict requiring design solutions or modifications to reduce the impacts and, if possible, blend the development with the surrounding landscape. The proposed landscape mitigation measures will be described and illustrated by means of site plans and photomontage and take into account factors including: • Screen planting • Transplanting of mature trees with good amenity value where appropriate • Conservation of topsoil for reuse • Sensitive alignment of structures to minimise disturbance to surrounding vegetation • Reinstatement of areas disturbed during construction • The design and finishes / colours of architectural and engineering structures such as terminals and pylons • Existing views, views of the development with no mitigation, views with mitigation at day one of operation and after 10 years of operation	Project site	Contractor/FEHD/Arch SD	*		*		EIAO-TM
S.8.2.15-S.8.2.19	Tree transplanting: The tree survey has identified the trees which will be affected by the development and which could be considered for transplanting prior to commencement of construction work. Felling is considered as a last resort and every effort should be made to transplant the many good trees of high amenity	Project site	Contractor/Arch SD	*		*	*	WBTC 7/2002, WBTC 14/2002, EIAO-TM

EIA ref.	Environmental Protection Measures/Mitigation Measures	Location/Timing	Implementation Agent and Stages	Implementation Stages				Relevant Legislation and Guidelines
				Con	Com	Dem	Ope	
	value to either nearby suitable sites within the cemetery or to available space in FEHD's Wo Hop Shek Crematorium pending identification of an alternative site. The feasibility of transplanting will depend on a number of factors such as size, health and species of the tree. Adequate time (a minimum of 4 months) should be allowed for preparing trees for transplanting. Weekly inspection of tree protection measures as well as monitoring of tree transplant operations during both phases should be implemented. Particular care should be taken to save the 9 nos. mature and semi-mature protected tree species and 12 nos. protected shrub and immature tree species identified. To give the protected species the best possible chance of survival it is recommended that they are relocated to sheltered and well maintained planted areas within the cemetery. The following measures for tree transplanting should be adopted: (a) Appoint a landscape contractor for the establishment and maintenance of the transplanted trees as well as any new tree planting for 12 months upon completion of the works. (b) Careful co-ordination of Phase I and II works to allow tree transplanting from Phase II site directly to Phase I site. <u>Tree protection</u>: Trees to be retained adjacent to works areas should be carefully protected by strong hoarding and if necessary additional			*				

EIA ref.	Environmental Protection Measures/Mitigation Measures	Location/Timing	Implementation Agent and Stages	Implementation Stages				Relevant Legislation and Guidelines
				Con	Com	Dem	Ope	
	protection to individual tree trunks to avoid damage by machinery. The hoarding will also prevent contractors from compacting soil around tree roots or dumping materials. Reference should be made to the guidelines for tree protection in the Government publication "Tree Planting and Maintenance in Hong Kong". Topsoil conservation: Any topsoil excavated during construction will be carefully saved and stored to one side of the works area for reuse upon completion. Replanting: Upon completion planting of ornamental trees and shrubs will be provided to the periphery of the new crematorium building to help screen and soften the overall appearance of the structure. In addition, a reprovisioned memorial garden with a lotus pond and ornamental planting will be incorporated in the deck area of the building. Since the majority of the new planting will be on the deck structure the selection of species will be more limited with emphasis on smaller trees and ornamental shrubs to comply with loading restrictions. Notwithstanding this site constraint on tree selection, a minimum of 1.2m soil depth will be provide for tree planting on the podium / roof structure for healthy establishment of the new tree planting.							
Landscape and Visual Impact Assessment (EM&A)								
S.11.3.14	Weekly inspections of tree protection measures as well as monitoring of tree transplant operations.	Project site / Phase II works	Project Landscape Architect	*		*		Landscape Master Plan,

EIA ref.	Environmental Protection Measures/Mitigation Measures	Location/Timing	Implementation Agent and Stages	Implementation Stages				Relevant Legislation and Guidelines
				Con	Com	Dem	Ope	
								Tree Planting and Maintenance in Hong Kong
S.11.3.14	Regular inspection of landscape maintenance work.	Project site / during the 1st, 6th and 12th month after completion of all recommended planting work	Project Landscape Architect				*	Landscape Master Plan, Tree Planting and Maintenance in Hong Kong
Water Quality								
S.9.6.1	Construction – General To safeguard the water quality of the WSRs potentially affected by the Project works, the contractor should implement appropriate mitigation measures with reference to the *Practice Note for Professional Persons, Construction Site Drainage* (*ProPECC PN 1/94*) published by EPD. Such measures are highlighted as follows.	Project site	Contractor	*		*		ProPECC PN 1/94
S.9.6.2-S.9.6.5	Construction Phases - Construction Run-off and Drainage Exposed soil areas should be minimized to reduce the potential for increased siltation, contamination of run-off and erosion. Any effluent discharge from the Project site is subject to the control of Water Pollution Control Ordinance (WPCO) discharge license and should be treated to meet the discharge standard set out in the relevant license. In addition, no site run-off should enter the stream on the eastern	Project site	Contractor	*		*		ProPECC PN 1/94

EIA ref.	Environmental Protection Measures/Mitigation Measures	Location/Timing	Implementation Agent and Stages	Implementation Stages				Relevant Legislation and Guidelines
				Con	Com	Dem	Ope	
	side of the Project site. Run-off impacts associated with the construction and demolition activities can be readily controlled through the use of appropriate mitigation measures, which include:							
	• Temporary ditches should be provided to facilitate run-off discharge into appropriate watercourses, via a silt retention pond • Boundaries of earthworks should be marked and surrounded by dykes • Open material storage stockpiles should be covered with tarpaulin or similar fabric to prevent material washing away • Exposed soil areas should be minimized to reduce the potential for increased siltation and contamination of run-off • Earthwork final surfaces should be well compacted and subsequent permanent work should be immediately performed • Use of sediment traps wherever necessary • Maintenance of drainage systems to prevent flooding and overflow							
	All temporary drainage pipes and culverts provided to facilitate run-off discharge should be adequately designed to facilitate rapid discharge of storm flows. All sediment traps should be regularly cleaned and maintained. The temporarily diverted drainage should be reinstated to its original condition, when the construction/demolition work is completed.							
	Sand and silt in wash water from wheel washing facilities should be settled out and removed from discharge into temporary drainage pipes or							

EIA ref.	Environmental Protection Measures/Mitigation Measures	Location/Timing	Implementation Agent and Stages	Implementation Stages				Relevant Legislation and Guidelines
				Con	Com	Dem	Ope	
	culverts. A section of the haul road between the wheel washing bay and the public road should be paved with backfall to prevent wash water or other site run-off from entering public road drains.							
S.9.6.2-S.9.6.5	Oil interceptors should be provided in the drainage system downstream of any significant oil and grease sources. They should be regularly maintained to prevent the release of oil and grease into the storm water drainage system after accidental spillage. The inceptor should have a bypass to prevent flooding during periods of heavy rain, as specified in *ProPECC PN 1/94*.	Project site	Contractor	*		*		ProPECC PN 1/94
S.9.6.6	Construction and Demolition Phases - General and Demolition Construction Activities All the solid waste and chemical waste generated on site should be collected, handled and disposed of properly to avoid affecting the water quality of the nearby WSRs. The proper waste management measures are detailed in S.7.7.5-S.7.7.6.	Project site	Contractor	*		*		ProPECC PN 1/94
S.9.6.7	Construction and Demolition Phases - Sewage Generated from On-site Workforce The sewage from construction work force is expected to be handled by portable chemical toilets if the existing toilets in the Project site are not adequate. Appropriate and adequate portable toilets should be provided by licensed contractors who will be responsible for appropriate disposal and maintenance of these facilities.	Project site	Contractor	*		*		ProPECC PN 1/94
S.9.6.8-S.9.6.10	Construction and Demolition Phases - Soil Remediation Activities	Project site	Contractor	*		*		ProPECC PN 1/94

EIA ref.	Environmental Protection Measures/Mitigation Measures	Location/Timing	Implementation Agent and Stages	Implementation Stages				Relevant Legislation and Guidelines
				Con	Com	Dem	Ope	
	Mitigation measures will need to be implemented during the currently identified soil remediation activities. If further land contamination investigation results (at locations S1 to S6 during Phase II) confirm the needs for further soil remediation prior to demolition of the Existing Crematorium, relevant water quality mitigation measures (in addition to the current RAP) will need to be identified and implemented by the contractor. In addition, the mitigation measures recommended for minimizing water quality impacts for construction and demolition run-off and drainage as well as for general construction and demolition activities should also be adopted where applicable.							
	In order to avoid impacts on water quality during further remedial works, care will be taken to minimise the mobilisation of sediment during excavation and transport. Measures to be adopted will be based on the recommendations set out in *Practice Note for Professional Persons ProPECC PN1/94 "Construction Site Drainage"*. The results of the site investigation suggest that there is unlikely to be any requirement for dewatering of excavations, since groundwater was not encountered in any of the exploratory holes.	Project site	Contractor	*				
	The contractor carrying out the remedial works will be required to submit a method statement detailing the measures to be taken to avoid water quality impacts. Typical measures would include:	Project site	Contractor					

EIA ref.	Environmental Protection Measures/Mitigation Measures	Location/Timing	Implementation Agent and Stages	Implementation Stages				Relevant Legislation and Guidelines
				Con	Com	Dem	Ope	
	• Carry out the works during the dry season (i.e. October to March) if possible • Use bunds or perimeter drains to prevent run-off water entering excavations • Sheet or otherwise cover excavations whenever rainstorms are expected to occur • Minimise the requirements for stockpiling of material and ensure any stockpiles are covered • Temporary on-site stockpiling of contaminated materials should be avoided, all excavated contaminated soils/materials should be disposed of on a daily basis • Ensure that any discharges to storm drains pass through an appropriate silt trap							
Hazard to Life								
S.10.3.3	<u>Fuel Storage and Transportation</u> The storage, transportation and handling of diesel fuel is under the control of DGO (Cap 295) and compliance with the DGO requirements should be ensured. Diesel leaks from the diesel fuel tanks or pipework systems may seep into the ground and enter chambers such as tunnels, drains and sewers. The undetected build-up of diesel in a confined space will create a fire hazard. The following safety measures should be observed around the diesel storage tanks during operation of the New Crematorium: • Inventory check should be conducted by staff regularly to identify any signs of fuel	New Crematorium / operation	FEHD				*	Dangerous Goods Ordinance (Cap 295)

EIA ref.	Environmental Protection Measures/Mitigation Measures	Location/Timing	Implementation Agent and Stages	Implementation Stages				Relevant Legislation and Guidelines
				Con	Com	Dem	Ope	
	leakage • Regular visual inspections to detect any early signs of fuel spillage • Precautionary exercises, including fire drills, should be regularly undertaken to enhance staff capability to handle emergencies							
S.10.3.4	DG Storage The design of DG store and its operation must comply with the requirements set in Cap 295. Precautionary measures mentioned below should also be followed, when relevant chemical is stored at the dangerous goods storage:	New Crematorium / operation	FEHD / Arch SD				*	Dangerous Goods Ordinance (Cap 295)
S.10.3.4	DG Storage -Handling and Labeling • Obtain details for the handling, storage and control of impurities and spills from supplier or manufacturer (e.g. MSDS[1]). • Obtain details of the chemical composition of the substances, and correct treatment with eyes, skin, ingestion, etc from the supplier or manufacturer (usually available in a MSDS) • Ensure the correct and complete labelling and classification of chemical substances and guidelines are adopted (see Labour Department's reference booklet on "Labelling and Classification of Dangerous Substances Commonly used in Industry") • Ensure that the information is up to date, provided to the relevant staff, and easily accessible in case of emergency in accordance with the site safety guidelines • Register dates (receiving date, manufacturing date, expiry date, shelf life	New Crematorium / operation	FEHD				*	Dangerous Goods Ordinance (Cap 295) Labelling and Classification of Dangerous Substances Commonly used in Industry

EIA ref.	Environmental Protection Measures/Mitigation Measures	Location/Timing	Implementation Agent and Stages	Implementation Stages				Relevant Legislation and Guidelines
				Con	Com	Dem	Ope	
	whereas applicable) and quantities of all purchases on receipt to minimise surplus and spoilt orders							
S.10.3.5	<u>DG Storage -Containers for Storage of Chemicals and Dangerous Goods (DGs)</u> The following practices shall be followed in ensuring the use of suitable containers for chemicals. • Designed to minimise spills • Ensure container is appropriate for its contents, resistant to corrosions, maintained in good conditions and securely closed • Provide proper labelling	New Crematorium / operation	FEHD				*	Dangerous Goods Ordinance (Cap 295) Labelling and Classification of Dangerous Substances Commonly used in Industry
S.10.3.6	<u>DG Storage - Storage Requirements</u> The following practices shall be followed in ensuring suitable storage (including temporary store for goods to be delivered) and transportation of chemicals and DGs. • No smoking in storage areas • No naked light and no heating equipment shall be used in any store. • No electrical equipment shall be used or installed in any store other than equipment of a type approved by the Authority. • There shall be at all times conspicuously displayed outside any store a notice, in English and Chinese, prohibiting smoking and the use of naked light • Segregate chemical substances to prevent reaction and contamination	New Crematorium / operation	FEHD				*	Dangerous Goods Ordinance (Cap 295) Labelling and Classification of Dangerous Substances Commonly used in Industry

EIA ref.	Environmental Protection Measures/Mitigation Measures	Location/Timing	Implementation Agent and Stages	Implementation Stages				Relevant Legislation and Guidelines
				Con	Com	Dem	Ope	
	• Use proper racks, storage bins and shelves to contain leaks • Storage areas must be locked to prevent unauthorised access, clearly labelled and solely for the storage (except for the temporary store for goods to be delivered) of chemicals/dangerous goods • Adequate ventilation in storage areas as necessary • Provide appropriate equipment and manpower to avoid the likelihood of spillage • DGs must be stored in the designated stores and the storage quantities must be within limits • All containers shall be kept upright to minimise the likelihood of spillage							
S.10.3.7	<u>DG Storage – Handling and Spill Prevention</u> The following practices shall be followed in ensuring suitable handling and spill prevention of chemicals and dangerous goods: • Follow the safety instructions provided by site management and chemical label • Do not misuse or interfere with safety equipment or appliance provided • Do not smoke, eat or drink in any place where chemical substances / DGs are stored or used	New Crematorium / operation	FEHD				*	Dangerous Goods Ordinance (Cap 295) Labelling and Classification of Dangerous Substances Commonly used in Industry
S.11.5.1	The New Crematorium operator should adopt environmental management plan for the operation of New Crematorium as a means to ensure satisfactory environmental performance of the facilities at all times.	New Crematorium / operation	FEHD				*	

Con -Construction

Com-Commissioning
Dem-Demolition
Ope -Operation

APPENDIX K
Event Action Plan for Odour Monitoring

Appendix K- Event Action Plan for Odour Monitoring

EVENT	ACTION			
	ET	IEC	AR	Contractor/Operator
ACTION LEVEL				
Perceived odour intensity (Higher than or Equal to Level 2) / Any incidence of odour complaint received	1. Checking monitoring data submitted by Contractor 2. Check Contractor's working methods 3. Discuss with Contractor on possible remedial measure 4. Supervise the implementation of the remedial measures	1. Checking monitoring data submitted by Contractor 2. Check Contractor's working methods 3. Discuss with ET and Contractor on possible remedial measure 4. Advise the AR & ET on the effectiveness of the proposed remedial measures 5. Supervise the implementation of the remedial measures	1. Confirm receipt of notification of failure in writing 2. Notify Contractor 3. Check Contractor's working methods 4. Discuss with ET, IEC and Contractor on proposed remedial actions 5. Ensure remedial actions properly implemented	1. Identify source 2. Inform AR & IEC 3. Repeat measurement to confirm findings 4. Increase monitoring frequency to daily 5. Discuss with AR & for remedial actions required 6. If exceedance continues, arrange meeting with AR & IEC 7. If exceedance stops, cease additional monitoring 2. Submit proposals for remedial actions to AR within 3 working days of notification 3 Implement the agreed proposals 4. Amend proposal if appropriate
LIMIT LEVEL				
Perceived odour intensity (Level 4) / Two or more odour complaints received within one month	1. Checking monitoring data submitted by Contractor 2. Check Contractor's working methods 3. Discuss with Contractor on possible remedial measure 4. Supervise the implementation of the remedial measures	1. Checking monitoring data submitted by odour patrol team 2. Discuss amongst AR, ET and Contractor on possible remedial measures 3. Review Contractor's remedial measures whenever necessary to ensure their effectiveness and advise the AR accordingly	1. Confirm receipt of notification of failure in writing 2. Notify Contractor 3. Carry out analysis of Contractor's working procedures to determine possible mitigation to be implemented 4. Discuss amongst ET, IEC and the Contractor on proposed remedial actions	1. Identify source 2. Inform AR, IEC, Contractor and EPD the cause & actions taken for the exceedances 3. Repeat measurement to confirm findings 4. Submit proposals for remedial actions to IEC, AR within 3 working

EVENT	ACTION			
	ET	IEC	AR	Contractor/Operator
		4. Supervise the implementation of the remedial measures	5. In consultation with IEC, agree with the contractor remedial measures to be implemented 6. Ensure remedial measure are properly implemented 7. If exceedance continues, consider what portion of the work is responsible and instruct the Contractor to stop that portion of work until the exceedance is abated	days of notification 5. Increase monitoring frequency to daily 6. Investigate the causes of exceedance 7. Carry out analysis of contractor's working procedures to determine possible mitigation to be implemented. 8. Arrange meeting with EPD, IEC and AR to discuss the remedial actions to be taken 9. Assess effectiveness of Contractor's remedial actions and keep EPD and AR & IEC informed of the results 10. Implement the agreed proposals 11. Resubmit proposals if problem still not under control 12. Stop the relevant portion of works as determined by the AR until the exceedance is abated