BEST Standard 1001

AUDIT PROTOCOL

BEST

Better Environmental
Sustainability Targets

April 2008

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BEST Standard 1001 Audit Protocol

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INTRODUCTION

Purpose:

The Better Environmental Sustainability Targets (BEST) Standard 1001 is an international voluntary initiative for the purpose of standardizing environmental performance goals for lead battery manufacturers in developing countries. The standard was developed with input from a wide range of stakeholders including nongovernmental organizations (NGOs), major battery companies, government, and bulk purchasers of batteries.

The standard is to be used to perform independent third party audits of lead battery manufacturing facilities. This "Better Environmental Sustainability Targets (BEST) Standard 1001 Audit Protocol" helps interpret specific provisions of the standard and provides guidance to auditors and lead battery manufacturers seeking certification against the standard.

The BEST Standard 1001 provides the criteria to evaluate the environmental performance of lead battery manufacturing facilities against three broad objectives as follows:

1. Reduce lead exposures in communities where lead batteries are manufactured.
2. Reduce lead exposures and improve the health and safety status of workers in lead battery manufacturing facilities that are occupationally exposed to lead and other hazardous materials
3. Increase the adoption of sustainable practices in order to reduce the environmental impact of lead battery manufacturing by encouraging efforts to minimize waste, lower emissions, reduce energy and water consumption, and encourage environmentally sound recycling

Although the emphasis is on controlling lead hazards, the standard also broadly addresses environmental impacts from lead battery manufacturing. However, the standard does not address recycling operations, transport, or other portions of the lead supply chain including mining, primary smelting, or mineral processing. Nor does the standard address wages, working conditions, or other social criteria not directly related to occupational health. There are already international standards such as SA8000 and ISO 14001 to address these issues.

The provisions of the BEST Standard 1001 may differ from applicable local, state, or national regulatory requirements. If regulatory requirements at a lead battery manufacturing facility are more stringent than the standard, or require more frequent verification than outlined here, then the regulatory provisions shall take precedence and become the de facto requirement in that jurisdiction.

How to Use the BEST Standard 1001 Audit Protocol:

This Best Audit Protocol has been developed in support of the BEST Standard 1001 with the ultimate goal of creating a more sustainable lead battery industry and improving public health through the reduction of lead exposures. The protocol specifies the detailed requirements that lead battery manufacturing facilities must meet to be in conformance with the criteria of the BEST Standard 1001. This document also provides guidance for auditors collecting information and corroborating records for verification. In some cases it describes other measures including visual inspection and interviews that may be used to ascertain whether the facility has successfully implemented the required components of the standard.

The audit protocol describes test methods and laboratory analytical procedures for a range of measurements required in the BEST Standard 1001. These tests and analysis are to be conducted by the lead battery manufacturer and reported in the format specified in this document. In the process of the audit, such records will be reviewed for compliance with the standard. It is not anticipated that auditors will collect any physical samples or take any measurements.

This guidance document does not impose any additional criteria on battery manufacturing facilities that are not already contained in the BEST Standard 1001. Instead it serves to illustrate the underlying programs, manuals, records, and physical infrastructure that are necessary to operate in conformance with the standard.

This protocol is being made available to all lead battery manufacturing facilities and other relevant stakeholders to encourage improvements and to maximize transparency in the audit process. Battery manufacturing facilities looking to improve occupational and environmental performance and to obtain BEST certification will find this protocol useful.

The audit protocol provides guidance to both in-house and independent third-party auditors who conduct environmental audits under the BEST Standard 1001. Independent audits will typically be conducted by a team of two or more auditors to bring more diverse expertise to the process and improve the efficiency of the data collection. The team will be under the direction of a “lead auditor” who is responsible for summarizing the findings into the audit report. The “client” or auditee are the battery companies that voluntarily elect to be audited under this standard in order to gain recognition for complying with the environmental performance criteria in the standard. Companies that meet these requirements are considered to be among the best in environmental performance among their competitors.

This audit protocol includes guidance on collecting evidence to demonstrate compliance with the BEST Standard 1001 and preparing audit reports. For each criterion in the standard, the document specifies the records and other corroborative evidence required to demonstrate conformance. It also explains the scoring system for the audit.

We anticipate that the BEST Standard 1001 will be updated on a three-year schedule to incorporate new technologies and practices while encouraging continual improvement in the environmental performance of the lead battery industry. Because the standard was developed with assistance of all relevant stakeholders, future updates will also be based on input from battery manufacturers, major purchasers, government, NGOs, and auditors. The audit protocol will also be revised every three years along with the update of the BEST Standard**.**

Lead Poisoning and Its Effects on Society:

Lead poisoning is one of the most serious environmental health threats to children and is a significant contributor to occupational disease. The World Health Organization (WHO) estimates that 120 million people are overexposed to lead (approximately three times the number infected by HIV/AIDS) and 99 percent of the most severely affected are in the developing world. Over 75 percent of all lead production goes into batteries.

Overwhelming evidence suggests that lead poisoning adversely affects nearly every system in the body, and even modest exposures reduce the learning capacity of children and compromise their future potential to contribute to society. While severe lead poisoning can cause coma or death, most overexposed individuals have no obvious symptoms. Millions of children with moderate environmental lead exposures from contaminated air, soil, water, and dust have a negative country-level impact on school performance indicators. Lead poisoning is also linked with hyperactive and violent behaviour in children.

Adult lead poisoning, usually from occupational exposures, also weighs heavily on society. Lead affects the brain, kidneys, blood, and the reproductive system in both men and women. At relatively low levels, lead is known to contribute to high blood pressure. The potential costs of lead poisoning to society are great, which is why many countries have taken steps to address the problem. However, voluntary incentive programs can also play an important role in encouraging the adoption of more sustainable practices within the lead battery industry.

GENERAL AUDIT AND REPORTING PROCEDURES

As noted earlier, this protocol describes procedures for auditors to follow to collect, assess, and report audit findings related to lead battery manufacturing. It also informs lead battery manufacturers of the required documentation necessary to demonstrate compliance with each of the criteria in the BEST Standard 1001.

Implementation Requirements:
Auditors will request to review all documents and records specified in this audit protocol including those pertaining to operational procedures for monitoring and controlling of emissions. If no specific documented programs or instructions are stipulated for a criteria, the auditor should still ensure that such practices are established and maintained through interviews with the responsible site personnel.

Collecting Audit Evidence:
The audit team will need to collect sufficient audit evidence to determine whether the auditee's environmental performance conforms to the BEST Standard. This audit protocol is a guide for determining the completeness of records and adequacy of observed conditions to evaluate these measures. The audit team will collect audit evidence through interviews, examination of documents, and observation of activities and conditions during site visit. At the same time they will record indications of nonconformity to the BEST Standard audit criteria based on the specified performance indicators.

The audit team will examine the basis of relevant sampling programs and the procedures for ensuring effective quality control of sampling and measurement processes used to verify compliance activities. The number and frequency of observations must meet the minimum standards described in this audit protocol.

Auditors will also need to verify information gathered through interviews with other supporting information from independent sources such as records, and results from testing conducted by government agencies or other outside consultants. Any unverifiable statements should be recorded as such.

Audit Findings:
The audit team will review the audit evidence to determine where the environmental performance does not conform to the BEST audit criteria. The purpose is to ensure that audit findings of nonconformity are documented in a clear, concise manner and supported by the audit evidence.

At the end of every audit arrange a closing meeting with the responsible site contacts to go over the preliminary findings. Audit findings should be reviewed with the responsible parties at the facility with a view to obtaining acknowledgement of the factual basis of all findings of nonconformity. Any nonconformance should be reported during the final meeting at the end of the audit. In the process, details of conformity may also be documented, but with care to avoid any implication of how such findings relate to overall audit score.

AUDIT REPORTS AND DOCUMENT RETENTION PROCEDURE

Preparation of Audit Report:

The audit report is prepared under the direction of the lead auditor, who is responsible for its accuracy and completeness. The audit report should provide a summary of the audit process, the results of the audit scoring, describe areas where improvements are recommended, and provide specific information on nonconformance. The document should reference the supporting evidence leading to specific audit findings.

The audit report should be dated and signed by the lead auditor. The report should contain the audit findings and a summary with reference to supporting evidence. The audit report may also include the following:

- The identifications of the organization audited.
- The agreed objectives, scope, and plan of the audit.
- The period covered by the audit and the date(s) the audit was conducted.
- The identification of the auditee's representatives participating in the audit.
- The identification of the audit team members
- The distribution list for the audit report
- A summary of the audit process including any obstacles encountered
- Audit conclusions such as:
  - Conformance to the BEST Standard;
  - Whether systems are being properly implemented to maintain conformance; and
  - Whether the internal management structure can ensure the continuing effectiveness of the BEST Standard.

Scoring and Reporting Audit findings:

Auditors must characterize all findings on the checklist in **Appendix A** into one of two categories based on the degree of agreement demonstrated with respect to each requirement. Compliance with each criteria is evaluated and scored according to the following:

- **NC** (Nonconformance): This designation distinguishes any criteria where the available evidence shows that the performance target is not being met, or where the documentation is incomplete or otherwise insufficient to meet the BEST requirements. Auditors may uncover a minor nonconformance in an aspect of a criteria, such as an oversight or non-systemic (e.g. episodic) problem that does not negate the overall performance target. In these cases they may still classify the overall result as in conformance for scoring purposes but elaborate the deficiencies in the audit report.

- **C** (Conformance): The audit findings indicate overall conformance with the specified requirement(s) of the criteria.

The criteria in the audit checklist attached in Appendix A are separated into classes with one relating to lead exposures (in bold) and all other environmental performance requirements (in plain text). Following the completion of the audit checklist, tally the C's in each column. An overall passing score for the audit requires that all 24 lead-related criteria are in conformance and that 24 of the 30 (80%) general environmental criteria are in conformance.

All nonconformances must be explained by the audit team so that it is clear to all parties which part or parts of a given criteria were not adequately met. The explanation given should be specific to the corroborative evidence described in this document. Report all nonconformances with explanation at the end of the audit during the closing meeting. In some cases, audit team and battery facility personnel should agree upon suggested corrective measures to remedy nonconformances and prevent a recurrence.

The lead battery manufacturing facility shall implement corrective actions at a level corresponding to suggested measures and document that corrective actions were promptly undertaken. In some cases, auditors may need to require that a specific action plan be prepared and submitted for review. The plan would respond to each nonconformance identified with an anticipated date by which actions will be undertaken to rectify the situation. The audit team will evaluate the feasibility of these action plans and indicate whether they agree or whether they consider them unlikely to succeed within the proposed timeframe.

In some cases, auditors may identify areas that are in conformance but that can still be improved with the adoption of a specific technology or practice. This information should be provided as an "opportunity for improvement" in the audit report. These audit findings, provide the facility with opportunities to improve their performance even in areas where the criteria are being fulfilled in

general; however, implementation of recommended improvements may still need to be monitored during future audits in order to prevent them from becoming NC's.

This document is arranged in three sections outlining the three broad objectives in the BEST Standard 1001 and the criteria to meet them. The objectives and criteria from the standard are presented in blue whereas the text describing which documents will be reviewed, and what inspections are to be conducted, by auditor are in black. The sections on corroborative evidence then summarize the performance requirements that are necessary to document compliance with each criteria.

For each criteria there is a discussion of the records, observations, and plans that will be reviewed as part of the audit. These are the specific items that should be provided to the audit team upon their arrival to conduct the audit. In some cases, specific reporting formats are provided for the facility to use to facilitate the maintenance of records in a standard format that can be easily reviewed.

OBJECTIVE 1: Reduce lead exposures in communities where lead batteries are manufactured

Criteria 1.1: Facility shall monitor the emissions into air and water regularly and ensure minimum discharges of lead into the environment.

To minimize environmental lead exposures, lead battery facilities shall monitor all potential sources of emissions into the environment and meet specified limits.

Indicator

Air Emissions

1.1.a. Measure the stack emissions every month for airborne lead and ensure it does not exceed **10.0 mg/Nm^3**.

Stack emissions are a major source of lead released into the air. All emission points within a lead battery manufacturing plant shall be vented to an emission collection system and ducted to a pollution control device, which shall reduce lead emission to the environment. Facilities shall measure the stack emission every month for airborne lead and ensure that it does not exceed **10 mg/Nm^3**.

Records:

As part of the audit procedure, review the stack emission monitoring plan, records of all air emission tests from the facility's stack (s), and records of noncompliance and corrective actions taken. These are discussed in more detail below.

Stack Emission Monitoring Plan. The plan should describe specific procedures and methods employed for testing lead from stack emissions. It should describe sample collection and analysis procedures to include the following:

- Sampling frequency;
- Sampling design, equipment and the number and location of samples;
- Quality assurance procedures;
- Sampling procedures and containers; and
- Sample labeling.

Qualified facility personnel shall conduct sampling and laboratory analysis. Stack sampling shall be accomplished by isokinetically withdrawing exhaust gas from the stack through a glass fiber filter and a sampling train consisting of probe, condenser, impringers, temperature sensor, metering system, barometer, gas density determination equipment, leak-free vacuum pump (capable of maintaining a

1.0 CFM flow rate at 15 inches of mercury), silica gel tube, and vacuum gauge. The lead measurement and analysis shall follow one of the approved methods or equivalent:

- U.S. EPA Test Method 12 - Determination of Inorganic Lead Emissions from Stationary Sources;
- U.S. EPA Test Method 29 - Determination of Metal Emissions from Stationary Sources; or
- ISO 9096 - Stationary source emissions: Determination of concentration and mass flow rate of particulate material in gas-carrying ducts-Manual gravimetric method.

Samples should be analyzed by:

- A laboratory that is accredited by the respective National Accreditation Authority and/or other certifying body for environmental testing; or
- A contracted laboratory that provides a self-certification that the quality of the analytical results has an accuracy to a confidence level of 95 percent within plus or minus 5 percent; or
- An in-house laboratory provided that 10 percent of the wastewater samples are submitted to independent accredited laboratory (which meets the criteria specified above) for analysis as duplicate samples for validation purposes.

The analytical data should include at least the following information:

- Date sampled;
- Date analyzed;
- Quantitative result and applicable units;
- Method used, detection limit; and
- The associated quality assurance and quality control results.

Records of all air emission tests from the facility's stack(s). Data shall be reported from all airborne lead measurements from the stack(s).

Records of noncompliance and corrective actions taken. Document each noncompliance instance of lead emissions from the facility over the past year along with its respective corrective actions and the conditions of compliance attained thereafter.

During the site visit, inspect the air monitoring equipment used for the stack emissions measurement to ensure that it is in good working condition.

Corroborative Evidence:

- The record review shall show that the facility maintains a lead monitor program for stack emission and that lead measurements are conducted at least once a month according to a written monitoring program. The facility must have records documenting and explaining any gap in the measurement frequency.

- The emission data must indicate that monthly measurements of airborne lead emitted from the stack do not exceed **10 mg/Nm^3**. The total number of noncompliance incidents shall not be more than three per year exceeding 10 percent above the standard. The analytical data shall also be defendable. The analysis shall be performed according to the approved methods and by a laboratory meeting the requirements stipulated above.
- The facility's air emissions permit shall be reviewed if local authority requires one.

Indicator
Air Emissions
1.1.b. Monitor lead content in ambient air twice a week (24 hr monitoring) and the values should be less than the standard of **1.0 µg/m^3** as an annual average.

Fugitive and stack emissions can contribute to the dispersal of lead particles from lead battery manufacturers into the neighbouring environment. Facilities shall determine ambient lead concentrations by monitoring the air twice a week (24-hour monitoring) in accordance with the following procedures.

Records:

Review the ambient air quality monitoring plan, the ambient air results, and records of noncompliance and corrective actions taken as described below.

Ambient Air Quality Monitoring Plan. Facilities shall develop and implement an ambient air monitoring program to determine lead content in the air at least twice a week (24 hour monitoring) at the property line of the facility where maximum ground level lead concentrations are estimated. The plan shall describe sample collection and analysis procedures to include the following:

- Sampling frequency;
- Sampling design, equipment, and the number and location of samples;
- Quality assurance procedures;
- Sampling procedures and containers; and
- Sample labeling.

The plan shall describe specific procedures for sampling and laboratory analytical methods.

The facility shall collect air samples on a glass-fiber filter for 24 hours using a high volume air sampler according to U.S. EPA 40 CFR part 50, Appendix B: *Reference Method for the Determination of Suspended Particulate Matter in Atmosphere (High Volume Method),* or equivalent. The air sampler draws a measured quantity of ambient air into a covered housing and through a filter during a 24-hour sampling period. It shall provide a means for drawing the air sample, via reduced pressure, through the filter at a uniform face velocity with a flow rate ranging from 1.1 to 1.7 m^3/min (40-60 cfm). The filters used shall have a minimum collection efficiency of 99 percent for 0.3 μm (DOP) particles.

The analysis shall follow U.S. EPA 40 CFR part 50, Appendix G: *Reference Method for the Determination of Lead in Suspended Particulate Matter Collected from Ambient Air*.

Samples shall be analyzed by:

1. A laboratory that is accredited by the respective National Accreditation Authority and/or other certifying body for environmental testing; or
2. A contracted laboratory that provides a self-certification that the quality of the analytical results has an accuracy to a confidence level of 95 percent within plus or minus 5 percent; or
3. An in-house laboratory; provided that 10 percent of the wastewater samples are submitted to an independent accredited laboratory (which meets the criteria specified above) for analysis as duplicate samples for validation purposes.

The analytical data shall include at least the following information:

- Date sampled;
- Date analyzed;
- Quantitative result and applicable units;
- Method used, detection limit; and

- The associated quality assurance and quality control results.

- **Ambient air sample results.** Data from all lead analysis results in ambient air taken at the facility over the past year shall be provided to the auditor for review. The annual average lead in ambient air shall not exceed **1.0 mg/m^3**.

- **Records of noncompliance and corrective actions taken.** The facility shall provide documentation each incident of noncompliance for lead concentration in ambient air along with its respective corrective actions and the conditions attained thereafter.

Corroborative Evidence:

- The record review shall show that the facility implements an appropriate ambient air monitoring program and that lead concentration in ambient air is measured at least twice a week (24-hour monitoring) at the designated sites according to the monitoring plan. The facility shall explain and document any discrepancy in the measurement frequency and testing location.
- Ambient air sampling results shall indicate that the annual average of lead content in ambient air does not exceed **1.0 mg/m^3**. The analytical data shall also be defendable. The analysis shall be performed according to the approved methods and by a laboratory meeting the requirements stipulated above.

Indicator
Waste Water Discharge
1.1.c. The various discharge points for waste water must be identified and classified for lead sources and, facilities must ensure that lead concentration in any waste water is not more than **0.1mg/l** before discharge.

Wastewater is one mode by which lead is released from lead battery manufacturers into the environment. Facilities shall regularly monitor and ensure minimum discharges of lead into the public sewer/marine water and/or inland waterway. Samples shall be collected at a time, place and manner so as most likely to be representative of the peak discharge.

Records:

As part of the audit procedure, auditors should review the facility's wastewater program, wastewater sampling plan, effluent water sampling, effluent water sample results, records of noncompliance and

corrective actions taken, and records of significant spills or leaks of toxic materials. These are discussed in greater detail below.

- **The facility's site-specific wastewater management control program and discharge permit** (if required by regulatory authority). The facility's program should include water runoff management and spill prevention and response procedures. The drainage and water treatment systems plan should identify all discharge points and classify them for lead sources. The facility should comply with the discharge permit received.

- **Wastewater sampling plan**. The plan should describe sample collection and analysis procedures to include the following:

    - Sampling frequency;
    - Sampling design, including number and location of samples;
    - Quality assurance procedures;
    - Sampling procedures and containers; and
    - Sample labeling.

    The plan shall describe specific storage and discharge locations, including pipe diameter, velocity, rate of discharge, procedures for grab and/or composite samples, and laboratory methods.

- **Effluent Water Sampling**. Review all sample results from 24-hour composite samples using a minimum of four (4) grab samples taken at least once a month. However, if wastewater is treated in batches, a minimum of one grab sample may be taken from each storage tank or other impoundment. The lead analysis should follow one of these approved methods or equivalent:

    - US EPA 200.7, Rev. 4.4 (1994)
    - US EPA 200.8, Rev. 5.4 (1994)
    - US EPA 200.9, Rev. 2.2 (1994)
    - ASTM D3559-96, 03 (A, B, or D)
    - ASTM D4190-94, 99
    - Lead Dithizone Method (US EPA Method 8033)

Samples should be analyzed by:

1. A laboratory that is accredited by the respective National Accreditation Authority and/or other certifying body for environmental testing; or
2. A contracted laboratory that provides a self-certification that the quality of the analytical results has an accuracy to a confidence level of 95 percent within plus or minus 5 percent; or
3. An in-house laboratory provided that 10 percent of the wastewater samples are submitted to independent accredited laboratory (which meets the criteria specified above) for analysis as duplicate samples for validation purposes.

The analytical data should include at least the following information:

- Date sampled;
- Date analyzed;
- Quantitative result and applicable units;
- Method used, detection limit; and
- The associated quality assurance and quality control results.

- **Effluent water sample results.** Lead concentration in any wastewater shall not be more than **0.1mg/l** before discharge into the public sewer/marine water and/or inland waterway.
- **Records of noncompliance and corrective actions taken.** Document each incident of noncompliance for elevated lead concentration in the discharged wastewater along with its corrective actions and the conditions attained thereafter.

- **Records of significant spills/leaks of toxic or hazardous materials in areas exposed to storm water or into a wastewater discharge location.**

Auditors should visually verify that the wastewater management control program is properly implemented as specified. The drainage and treatment systems should be in operational condition. Also check all water discharge points. Those classified for lead sources should be identified in the wastewater management control program.

Corroborative Evidence:

- Document review and onsite visual and/or physical audit to confirm that the facility's waste water management control program is properly implemented as specified, that the drainage

and treatment systems are in operational condition, and that all discharge points classified for lead sources are identified.

- Results of lead concentration in any wastewater should not exceed 0.1mg/l before discharge to public sewer/marine water and/or inland water. The total number of noncompliance incidents shall not be more than three per year exceeding 25 percent above the standard. The analytical data should also be defendable. The analysis should be performed according to the approved methods and by a laboratory meeting the requirements stipulated above.
- The auditor should review the facility's records of compliance with a discharge permit (if required by local authority).

Criteria 1.2: Facility shall check the performance of all pollution abatement techniques/measures and reduce discharges of lead into the air.

Ensuring proper installation and performance of pollution control equipment can help reduce the level of lead exposures in communities where lead batteries are manufactured. The facility shall check the performance of all pollution controls to ensure that they are functioning as intended and that such controls are adequate to reduce the discharge of lead into the air.

Indicator

1.2.a. Ensure that control equipment including, but not limited to, bag filters and scrubbers is in place and operational.

Efficient pollution control equipment installed at lead manufacturing plants can reduce lead emissions into the air by more than 90 percent, but poor maintenance or improperly installed equipment may greatly reduce performance efficiencies. Therefore, each emission collection system and lead control device shall, at minimum, be maintained and operated in accordance with the manufacturer's specifications.

The facility shall develop a maintenance program and perform regular maintenance and good housekeeping practices for all equipment to prevent the deterioration of control equipment performance. The facility shall also inspect all fabric filters for structural and filter integrity at least once every six months.

Records:

Review the maintenance log of pollution control equipment and the maintenance program.

Corroborative Evidence:

- The document review and onsite visual audit is conducted to confirm that the facility's pollution control equipment including, but not limited to, bag filter and scrubbers is in place and operational and that good housekeeping practices are incorporated.

Indicator
1.2.b. Carry out performance testing of pollution control equipment at each stage of the process to ensure that it is functioning as intended and that such controls are adequate to minimize air emissions.

Facilities that use a scrubbing system shall install, calibrate, maintain, and operate a monitoring device that measures and records the pressure drop across the scrubbing system.

Facilities shall also perform and keep records of semi-annual fabric filter inspections and do one of the following:

1. Measure and record the pressure drop across the fabric filter at least once per day;
2. Conduct daily visible emission observations. If visible emissions are detected, make an opacity measurement; or
3. Conduct weekly pressure differential monitoring for emission units that use HEPA filters in combination with fabric filters.

Records:

Review the maintenance program and all performance-testing records of the control equipment at each stage of the process. Records shall clearly indicate that the facility has thoroughly conducted fabric filter inspections, as well as at least one of the three recommended inspections above, in accordance to the criteria schedule listed above.

Corroborative Evidence:

- Document review and on-site visual and/or physical audit to confirm that the facility's control equipment at each stage of the process is functioning as intended and is adequate to minimize air emissions.

Indicator

1.2.c. Ensure that a stack, minimum height 30m, connected with hood and fan, is in place and all the emissions from sources are routed through this.

All lead point sources within the facility shall be vented to an emission collection system. The emissions from the stack shall not result in excessive concentration of air contaminants as a result of atmospheric downwash, wakes, or eddy effects created by the source itself, nearby structures, or nearby terrain features. Good engineering practices require ventilator control systems to consist of the following:

- Hoods over lead processing areas;
- Fans with a constant flow rate that draws air from under the hood;
- Ducts connecting hoods to the stack;
- Pollution control equipment, such as filters and scrubbers; and
- An emission stack at least 30 meters in height.

Records:

Review emission collection and ventilation system plans. The system shall be designed such that process emissions will not routinely escape the lead processing areas, except as vented through the emission stack.

Corroborative Evidence:

- The on-site visual and/or physical audit confirms that the facility's emission collection system is properly installed and adequate to minimize air emissions. Hoods and fans are properly installed at all lead emission sources. All emission points are ducted to a stack with a minimum height of 30 meters.

Indicator

1.2.d. Ensure that control equipment is operating throughout when the manufacturing process is being carried out in areas serviced by this equipment.

To effectively reduce lead discharged from the manufacturing plants, it is essential that all control equipment be in good operational condition.

Records:

Review any records of equipment maintenance or shutdowns.

Corroborative Evidence:

- During the audit, observe the operating condition of the control equipment. Conduct, as necessary, a smoke test of the control equipment at each stage of the process to ensure that the equipment is operating throughout when the manufacturing process is being carried out in areas serviced by this equipment.
- Confirm during the audit that the facility's control equipment is operating properly when the manufacturing process is being carried out in areas serviced by this equipment.

OBJECTIVE 2: Reduce lead exposures and improve the health and safety status of workers in lead battery manufacturing facilities that are occupationally exposed to lead and other hazardous materials.

Lead poisoning is one of the most serious environmental health threats to children and is a significant contributor to occupational disease. Lead battery manufacturing facilities shall develop and implement efficient occupational lead poisoning prevention programs to reduce lead exposures and improve the health and safety status of their workers. Precautions shall be taken to prevent lead dust from being transferred by workers to the environment outside of the facility and to their homes.

Criteria 2.1: Facility shall identify the potential for workers to be exposed to lead.

Lead exposures in battery plants pose significant health risks to workers. Lead battery manufacturers shall assess occupational lead exposures and develop control strategies.

Indicator

2.1.a. List processes and work areas with potential for worker lead exposure.

Identify and list manufacturing processes, work areas, and jobs with potential lead exposure for workers for each lead battery plant.

Records:

As part of the audit procedure the auditor will review the following documents:

- **The facility's plant layout and manufacturing processes.** The plant layout and manufacturing processes shall provide the schematic outline of potential lead contamination sources.
- **Processes and work areas listed with potential lead exposure, may include the following in Table 2.1 below:**

Table 2.1

Process and Work Areas with Potential Lead Exposure

Oxide and Grid Processing	Plate Casting	Plate Processing	Battery Assembly	Environmental Controls	Maintenance/ Cleaning Work
Oxide production,	-	Grid pasting,	Stacking lead plates,	Wastewater treatment plant, and	-
Oxide receiving, and	-	Hydrosetting,	Group burning,	Air handling/baghouse equipment areas.	-
Paste mixing.	-	Parting,	Intercell welding and post burning, and	-	-
-	-	Enveloping and wrapping of lead plates, and	Formation.	-	-
-	-	Handling and transport.	-	-	-

Corroborative Evidence:

- Indicate from the record review and onsite visit that the facility has identified, assessed, and made a comprehensive list of all processes and work areas with potential lead exposures.

Indicator
2.1.b. Catalogue the controls being used by process and work area listed in 2.1.a above.

Catalogue all engineering controls and work practices used to reduce the workers' exposures to lead according to the list of manufacturing processes and work areas specified in Indicator 2.1.a.

Records:

Review the facility's catalogue of lead controls used in each work area. The list shall be consistent with the inventory required under Indicator 2.1.a. Engineering controls by process area may include some or all of the following:

Oxide and Grid Processing:

- Local exhaust ventilation systems,
- High efficiency (HEPA)-filtered bin vents,
- Enclosed and exhaust ventilated conveyor,
- Wetting floors to suppress dust generation,
- Enclosures around mixing platform,

- Laminar flow (supplied-air) island systems (system designed to provide a zone of fresh air through the worker's breathing zone at a low enough velocity so that additional lead dust in air is not generated through re-entrainment);
- Local slot ventilation,
- Ventilated torch for cutting,
- Suspended plastic curtains separating casting areas from traffic areas, and
- Daily cleaning to reduce lead dust accumulation.

Plate Casting:

- Local exhaust ventilation for the casting while pouring molten lead,
- Laminar flow (supplied-air) island systems,
- Automatic drossing machines to skim off solid impurities floating on top of the molten lead into an exhaust ventilated container,
- Molten lead temperatures less than 1,000°F or 538°C,
- Minimal use of a torch for equipment cleanup,
- If torch is used, portable local exhaust ventilation or ventilated torch, and
- Daily cleaning to reduce lead dust accumulation.

Plate Processing:

- Local exhaust ventilation systems,
- Laminar flow (supplied-air) island systems,
- Fine water mist for paste return belts,
- Ventilated scrap barrel/drum,
- Vacuum drops at workstations,
- Enclosing and ventilating equipment, such as band saws and grinders, and
- Daily cleaning to reduce lead dust accumulation.

Battery Assembly:

- Local exhaust ventilation systems,
- Downdraft or slot ventilation at workstations,
- Grated or perforated plate tamping stand,
- Exhaust ventilated storage racks,
- Laminar flow (supplied-air) island systems,
- Clear plastic or glass guard between breathing zone and conveyor carrying battery,
- Lowered burning temperatures by substitution of air-propane gas for oxyacetylene flame, and
- Daily cleaning to reduce lead dust accumulation.

Check and compare the lead controls on the list provided during the audit against equipment and procedures followed in work areas.

Corroborative Evidence:

- Conduct a record review and onsite inspection to verify that all controls listed by the facility as per the above example are being employed in the manufacturing processes in each specified work area.

Criteria 2.2: Facility shall evaluate workers' airborne exposure to lead

Indicator

2.2.a. Conduct full-shift personal air monitoring on workers and work areas with the greatest potential for lead exposure with a sufficient sample size and frequency necessary to provide representative data for each process and work area listed in *Indicator 2.1.a*. above.

The evaluation of workers' and work area exposures to airborne lead shall be conducted at least once per year following these guidelines:

Sampling Equipment:

- Battery operated, low volume sampling pumps with a flow rate of 1 to 4 litres per minute (lpm),
- Flexible sampling tube (attaches over the shoulder of the worker), and
- Mixed cellulose ester (MCE) filter, 0.8 μm pore size, 37-mm diameter cassette and holder.

Laboratory Analytical Equipment:

- Portable Ultrasonic Extraction/ASV (Anodic Stripping Voltammetry),
- Flame AAS (Atomic Absorption Spectrophotometer), or
- ICP-AES (Inductively Coupled Argon Plasma, Atomic Emission Spectroscopy).

Sampling and Analytical Method:

- NIOSH Method 7701 (using ASV),
- NIOSH Method 7082 (using AAS), or
- NIOSH Method 7300 (using ICP).

To conduct air sampling, workers must wear battery-operated samplers (with the filter cassette in a downward position) in their breathing zones for a full work shift. Before sampling, pumps must be

calibrated with a representative filter cassette to ensure a sample flow rate of 1 to 4 lpm for the full shift. Multiple air sample cassettes may be used for each individual sampled. Field logs recording the flow rate and tracking the time the pump is worn are very important to obtain accurate results.

The facility shall conduct air monitoring that is representative of each work area and include at least 15 percent of the workers in each area with a minimum of two (2) workers per area. Air monitoring should also be conducted for a full shift under conditions that represent each worker's normal daily exposure to lead.

Samples shall be analyzed by:

1. A laboratory that is accredited by the respective National Accreditation Authority and/or other certifying body for environmental testing; or
2. A contracted laboratory that provides a self-certification that the quality of the analytical results have an accuracy to a confidence level of 95 percent within plus or minus 5 percent; or
3. An in-house laboratory provided that 10 percent of the air samples are submitted to independent accredited laboratory (which meets the criteria specified above) for analysis as duplicate samples for validation purposes.

Air sampling in accordance with these provisions must be conducted annually or within 30 days after any of the following:

- New production equipment is installed,
- Modification or maintenance is performed on production equipment,
- New engineering controls are installed,
- Modification or maintenance is performed on engineering controls, and/or

Records:

Review the records and data from the initial air sampling performed in work areas and from workers in areas with greatest risk for lead exposure. Summarize air monitoring results in a tabular format and include the following information (see Table 2.2):

- Sample number and date;
- Source location of the sample (e.g., Personal or Area Sample);
- Description of work area and processes taking place during sampling;
- Start and stop time;
- Sample pump flow rate; and

- Analytical result;

Table 2.2
Lead Air Sampling Log

Lead Air Sampling Log							
Sample Number	**Date**	**Source Location (Personal/Area Sample)**	**Sample Description**	**Start Time (min)**	**Stop Time (min)**	**Flow Rate (lpm)**	**Analytical Result (µg/m3)**

Abbreviations:
lpm = liters per minute.
min = minutes

Request from the facility, for review, its sample collection data forms, laboratory report forms and chain-of-custody documentation.

Corroborative Evidence:

- The record review shall confirm that the facility has conducted air monitoring at the required frequency as mandated in these provisions, has implemented an effective program to evaluate workers' airborne exposure to lead, that the appropriate analytical methods are being used, and that air monitoring is representative of the workers' exposure to lead.

Criteria 2.3: Facility shall control worker lead exposures to specified permissible levels

Indicator

2.3.a. Install new or modify existing engineering controls (e.g., local exhaust ventilation) at machines, processes, or work areas where personal air monitoring results exceed **50 µg/m^3** lead.

Air monitoring results that show levels of lead in air greater than the permissible limit (i.e., the maximum concentration of lead in air deemed acceptable for workplace exposures) of 50 µg/m^3 shall require the installation of additional engineering controls or the repair or maintenance of existing controls to reduce lead levels below 50 µg/m^3. If regulatory requirements are more restrictive, then

the applicable regulatory standard shall take precedence and become the de facto requirement in that jurisdiction.

Should corrective action be required to reduce air lead levels to below the permissible limit (i.e. that maximum concentration of lead particulates deemed acceptable for workplace exposures) of 50 $\mu g/m^3$, the facility should maintain an air monitoring log detailing which area(s) require corrective action, samples taken, and air analysis results summary (see example Table 2.3-1). Monitoring shall be conducted monthly until the average lead in air concentrations are below the permissible limit.

Table 2.3-1
EXAMPLE: Lead Air Monitoring Log/Corrective Actions

Lead Air Monitoring Log Corrective Actions						
Date	**Sample Description**	**Number Samples Taken**	**Lead Air Results ($\mu g/m^3$)**			**What Corrective Action Was Taken As A Result?**
			Average	**Minimum**	**Maximum**	
30Aug06	Plate Stacking area	5	57.2	48.1	81.3	Install exhaust booth hood over stacking table
21Sep06	Plate Stacking area	5	21.0	12.2	32.5	Sampling post installation

The following illustrates the types of acceptable engineering controls that can be installed in locations where exposure levels exceed 50 $\mu g/m^3$.

Example

Air monitoring results conducted as required in 2.2.a showed that air lead levels in the Plate Stacking area were greater than 50 $\mu g/m^3$. An investigation indicated that there was inadequate ventilation at this station. The facility then installed an Exhaust Booth Hood at the Stacking Station and repeated air sampling to demonstrate a reduction to 21.0 $\mu g/m^3$.

Records:

Review the following records:

- Data as detailed in *Indicator 2.2.a.*, and the following (if applicable):
- A list of work areas, operations, and dates that exceed the stipulated criteria above;
- A description of corrective action(s) taken;
- Purchase and installation records for engineering controls installed in response to air lead levels exceeding the permissible level;
- Maintenance or repair records for existing controls conducted in response to air lead levels exceeding the permissible level; and
- Lead air monitoring log for corrective actions.

Corroborative Evidence:

- Record review shall confirm that the facility has maintained airborne lead levels below 50 $\mu g/m^3$.
- Record review shall confirm that corrective actions have been taken to lower airborne lead levels below 50 $\mu g/m^3$ when needed.
- Compare the records from five percent of all sample results on air monitoring field logs and analytical reports against the data summary in Table 2.3.1.

Indicator

2.3.b. Repeat personal air monitoring on workers in areas with new or modified production equipment or engineering controls to ensure that controls are effective and lead levels are maintained below 50 $\mu g/m^3$.

After installing new production equipment or engineering controls or modifying existing production or controls, the facility shall conduct personal or area air monitoring in those areas to ensure that engineering controls are effectively maintaining lead levels below 50 $\mu g/m^3$. If air monitoring results reveal lead levels above 50 $\mu g/m^3$, corrective actions shall be taken and additional air sampling must be conducted as detailed in *Indicator 2.2.a.* until lead levels drop below 50 $\mu g/m^3$.

Once the analytical results show that airborne lead levels are below 50 $\mu g/m^3$, the facility must then document, in the maintenance log, the corrective action(s) taken and the resultant air lead level.

Records:

As part of the audit procedures, review the following records:

- Facility purchases of new production equipment or engineering controls,
- Facility Maintenance Log – summarizing the following information:

- Date(s) of installation and/or maintenance of production or engineering control equipment,
- Description of equipment and reason for replacement or maintenance,
- Air lead levels (in accordance with 2.2.a) after installation and/or maintenance of production or engineering control equipment,
- Facility maintenance records (if needed) for production equipment and engineering controls;
- Air monitoring analytical results showing lead levels below 50 µg/m3, and
- Corrective action(s) taken to reduce lead levels if air monitoring reveals lead levels above 50 µg/m3.

Corroborative Evidence:

- Record review shall indicate that the facility has maintained lead levels below 50 µg/m3 in areas with new or modified production equipment or engineering controls.

Indicator

2.3.c. Require workers to wear respirators with a minimum protection factor in locations where the management has failed to maintain lead exposure levels equal to or less than 50 µg/m^3 by other means.

As inhalation is the major route of exposure to airborne lead, respiratory protection must be used in areas where other measures have failed to adequately reduce exposures. The facility shall make mandatory the use of respiratory protection for workers in areas where airborne lead levels exceed the permissible limit of 50 µg/m^3.

Use of a respirator may put a physiological burden on the worker that can vary from the type of respirator being worn to the work environment in which the respirator is used and the medical status of the worker. As such, the facility shall have a licensed physician or other licensed health care professional perform medical evaluations on workers to determine their ability to use a respirator. These medical evaluations should include a pulmonary function test as well as the requirements in Criteria 2.6.

Before assigning respirators, the facility shall conduct a "Fit Test" to ensure that the respirator to be worn by the worker is properly fitted to his/her face and does not allow for any leakage. Respirators of at least three sizes should be made available for fit testing purposes. Fit testing should be repeated annually based upon the date of the previous fit test. Workers required to wear tight-fitting respirators

CANNOT have any facial hair and must shave daily. Facial hair prevents the respirator from making a proper seal against the skin and therefore reduces the level of protection provided.

Fit testing is conducted as follows:
Worker is placed in an enclosed space while wearing the respirator with appropriate cartridges.

- A test agent is administered near the worker's face while he or she moves the head around, moves in place, and is asked to talk. Testing agents include:
  - Stannic Chloride with HEPA or P100 series filters;
  - Isoaml Acetate with organic vapor cartridge;
  - Saccharin Solution Aerosol with a particulate filter; or
  - Bitrex™ (Denatonium Benzoate) with any particulate filter.
- Any break in the seal will cause the worker to react, indicating an unsuccessful fit test.
- Another respirator size must be chosen and the test repeated.

For taste Saccharin and Bitrex™ fit testing, the worker cannot eat or drink anything for at least 15 minutes prior to the test. A screening test for odor or taste should not be conducted in the room where the actual fit testing is being done.

Negative pressure respirators must be equipped with high-efficiency (HEPA) filters from the same manufacturer of the respirator face piece. HEPA filters are 99.97 percent efficient against mono-dispersed particles of 0.3 µm (micrometers) in diameter and are generally designated as N100, R100, or P100 filters. Filters must be changed regularly whenever the user notices any resistance to breathing.

If using P100 fabric or "flat pancake" HEPA filters, a hard shell HEPA respirator filter of the same brand should be used for proper fit testing.

If airborne lead levels ever exceed 500 µg/m^3, workers must wear a full-face mask air-purifying respirator with HEPA filters.

Following the fit test, document the worker's name, test date, and respirator model and size.

The facility must maintain a respirator use log that summarizes the names of workers required to wear respirators, their work area(s), type of respirator being used by the worker, and date of last fit test (see Table 2.3-2).

Table 2.3-2
EXAMPLE: Respirator Use Log

RESPIRATOR USE LOG					
Name of Worker	**Production Area**	**Respirator Model**	**Size**	**Fit Test Method**	**Date of Fit Testing**
John Doe	Oxide Production	3M	Medium	Stannic Chloride	15Nove06
Sam Jones	Plate Casting	3M	Large	Stannic Chloride	10Dec06

Respirators MUST be cleaned on a daily basis using warm water and soap. The task may be assigned to individual workers or conducted in a central location.

In addition to daily cleaning, the facility shall train workers on respirator maintenance and care. Workers should be instructed to inspect respirators for damage and report damage or any malfunction to a supervisor.

Respirators must be properly stored to prevent damage from exposure to dust, moisture, sunlight, chemicals (e.g., solvents), extreme temperatures, and impact.

Records:

Review the Respirator Use log (Table 2.3.2). Then crosscheck it against the air monitoring records (see *Indicator 2.2.a.*) to ensure respiratory compliance.

Corroborative Evidence:

- The record review and on-site visit shall confirm that workers required to wear respirators:
  - Have been fit tested within the past year,
  - Are using the appropriate respirator filter cartridge for the work being performed,
  - Have been properly instructed on maintenance and care of their respirator,
  - Are clean shaven, and
  - Are properly cleaning and storing their respirators.

Criteria 2.4: Facility shall minimize the potential for lead contamination from workers' skin, hair, and clothing.

Indicator

2.4.a. Provide daily clean coveralls or similar full-body work clothing to include gloves, caps, shoes (or disposable shoe coverings), and eye protection (if needed) to workers.

The facility shall provide the appropriate personal protection equipment, including (1) coveralls or similar full-body clothing, (2) gloves, (3) caps, (4) shoes or disposable coverlets, (5) and face shields or vented goggles as needed. The facility shall provide these items at no cost to the workers and shall also provide for the laundering or disposal of protective clothing.

Workers may not leave the site wearing their work clothing or coveralls. The facility shall provide workers with clean changing areas equipped with separate storage facilities for protective work clothing and for street clothes so as to prevent cross-contamination.

The facility shall provide a closed container in the changing area in which to place protective clothing to be cleaned or laundered. This container should be labeled to warn that items in container are contaminated with lead. For example: "CAUTION: CLOTHING CONTAMINATED WITH LEAD. DO NOT REMOVE DUST BY BLOWING OR SHAKING."

Corroborative Evidence:

- The onsite visit will confirm the following:
  - Workers have and are using the appropriate protective clothing and equipment,
  - Adequate facilities are made available to workers to change out of street clothes and into work clothes (i.e., separate locker/changing rooms for male and female workers),
  - Changing rooms have a properly designated closed container with the appropriate warning labels on it for contaminated clothing, and
  - Changing rooms have separate areas to store protective equipment such as respirators and protective clothing so as not to cross-contaminate with personal clothing items.

Indicator

2.4.b. Provide showers and hand washing facilities with soap and clean water.

One shower must be provided for every 12 employees who are required to shower at the end of the day or during the same shift change. Clean towels will be provided to each worker that uses showers.

Hand and body soap must be provided to adequately accommodate the number of sinks and showers.

Corroborative Evidence:

- On-site visit shall indicate that showering facilities and hand washing facilities are clean and in good working order.

Indicator
2.4.c. Require workers to wash hands with soap before each break and to shower at the end of each shift.

Facility shall require all workers to wash hands with soap before each break and before exiting the work area for any reason. Facility shall also require all workers exposed to lead to shower at the end of each work shift. Adequate and suitable facilities shall be provided and maintained providing screened and separate facilities for male and female workers. Facilities should also be conveniently accessible and be kept clean.

Corroborative Evidence:

- On-site visit shall confirm that workers are afforded the appropriate number of hand washing and showering facilities, and that they are kept clean.
- On-site visit shall confirm that hand washing facilities are properly stocked with hand soap, and hand drying towels (e.g., paper towels or electric hand drying blowers). Shower facilities shall be properly stocked with body soap and clean towels.
- Audit shall also confirm that workers are aware of and abiding by hand washing and showering policies, that showering facilities are adequate for both male and female workers.

Indicator
2.4.d. Prohibit the consumption of food or drink in the workplace.

Facility shall prohibit food and drink items in work area to minimize the potential for contamination and the ingestion of lead dust.

Corroborative Evidence:

- On-site visit shall indicate that signs/placards are posted in work areas stating that food and drink items are prohibited. Verify that no food or drink items are located in the work area during the inspection.

Indicator
2.4.e. Provide a separate eating area for workers that is removed or protected from the sources of lead exposure.

Facility shall provide an eating area that is separated from all production areas with rigid walls or other equivalent barriers and has a positive-pressure, filtered air supply or is located in a separate building away from battery production areas

Corroborative Evidence:

- As part of the audit procedures, auditors should inspect eating areas.

Indicator
2.4.f. Do not allow workers to enter eating areas without removing coveralls and washing their hands and face with soap and water.

Workers must not enter into eating areas without first removing coveralls or other protective equipment. Alternatively, workers may place a clean suit over their work clothing before proceeding to lunch facilities. Boots should also be cleaned at a boot wash station or removed before entering into eating areas. Workers must also thoroughly wash hands and face with soap and water before eating or drinking.

The facility shall take into account the time needed for workers to put on and take off protective clothing and equipment. As such, the facility shall allow each worker sufficient time to remove protective clothing and equipment before taking breaks and sufficient time to suit up after such breaks.

Corroborative Evidence:

- On-site visit shall indicate that the facility has implemented good hygiene practices preventing employees from entering into eating areas with potentially contaminated clothing.

Criteria 2.5: Facility shall monitor workers' blood lead levels and take steps to reduce levels if necessary.

Indicator

2.5.a. Collect samples for blood lead analysis from all workers:

- Before they start work at the plant;
- After they have been employed for at least 3 months (but before 4 months)
- Half yearly thereafter as long as levels do not exceed 40µg/dl for men or 30 µg/dl for women;
- Allow for more frequent sampling intervals if requested in writing by a licensed physician
- When a worker's blood lead level is greater than 40 µg/dl for men and 30 µg/dl for women, require more frequent blood lead monitoring and action as specified below.

Measurement of lead in blood is the most useful method for assessing a worker's exposure to lead from air and dust. As many workers have previously been exposed to lead, initial blood lead level testing should be performed prior to their start of work as to provide the employer with a baseline blood lead level. Additionally, before a new employee's 4th month of work, a second blood lead level screening shall be performed.

The testing schedule outlined above, provides the minimum frequency by which workers shall be tested. If a licensed physician determines, as a result of the worker's medical surveillance or previous blood lead level examination, that he or she should be tested more frequently; accommodations will be made in accordance with the physician's recommendations to have the worker tested on a more frequent basis as stipulated.

The facility shall maintain an employee blood lead level monitoring log (see Table 2.5-1). This form will be maintained for all workers who require monitoring.

Table 2.5-1
Employee Blood Lead Monitoring Log

EMPLOYEE BLOOD LEAD MONITORING LOG					
Name/Job Title	**Signature**	**Sample Date**	**BLL (µg/dl)***	**Reason for test?**	**Required Action?**

Abbreviations:
BLL = Blood Lead Level

Notes:
*If BLL exceeds 40 µg/dl for men or 30 µg/dl for women, they must immediately be followed under Medical Removal Program.

Records:

The auditor shall review the employee blood lead level monitoring log records as per Example 2.5-1. Records must include employee name, date of test, result and action taken. Additional records may include those required for Indicator 2.5 b.

Corroborative Evidence:

- Record review will confirm that the blood lead levels of workers are being tested according to the mandated schedule and frequency.

Indicator

2.5.b. Obtain the services of a qualified phlebotomist, occupational physician, or nurse and arrange for blood lead analysis by a laboratory that is accredited by the respective National Accreditation Authority for biological/medical testing, which certifies that the reported results are accurate to a confidence level of 95 percent within plus or minus 5 percent. If blood lead analysis is conducted by an in-house laboratory, arrange for an independent accredited laboratory to analyze duplicates of at least 10 percent of the blood samples for validation purposes.

A licensed physician or nurse, or certified phlebotomist must perform blood lead sampling.

Phlebotomists are trained to draw blood from a vein, either for laboratory tests, or for blood donations. These individuals must be trained and certified by an accredited laboratory or other medical training facility.

Because of the potential for contamination with lead dust from the skin, only venous blood samples are appropriate for the determination of blood lead levels among battery workers.

The phlebotomist must ensure that the materials used to store or transport the blood do not contain lead, which could contaminate the specimen. In purchasing such supplies, the phlebotomist or battery company should require that the manufacturer certify that the PVC tubes and collection apparatus are lead-free before using them for blood lead collection.

Blood lead level analysis should follow one of the following methods:

- NIOSH Method 8003, Flame Atomic Absorption Spectrometry (AAS),
- NIOSH Method 8005 Inductively-Coupled Argon Plasma-Atomic Emission Spectroscopy (ICP-AES), or
- Anodic Striping Voltammetry (ASV such as the LeadCare 3010B)

The use of portable blood lead testing devices using finger stick (capillary) methods is not considered an alternative to the laboratory methods listed above.

Analytical testing must be done by a laboratory accredited by the respective National Accreditation Authority for biological/medical testing, which certifies that the reported results are accurate to a confidence level of 95 percent within plus or minus 5 percent. Blood lead level testing performed by an "in-house" laboratory must have an independent, accredited laboratory analyze at minimum 10 percent of duplicate samples for validation purposes.

Records:

Review blood lead level testing records that detail the following:

- The name, date, and copy of certifications/licenses for the physician, nurse, or phlebotomist who performed blood sampling;
- Method by which blood was drawn;
- Chain-of-custody forms from sampling technician to analytical laboratory;
- Copy of analytical laboratory's accreditation and whether this is an independent or an in-house laboratory;
- Method by which blood lead level was analyzed;

- Blood lead level results; and
- Blood lead.

Indicator

2.5.c. Notify workers in writing of their individual blood lead levels within 5 working days of receipt of the results from the laboratory.

Written notification of blood lead level results to workers will clearly state the **sample date** of the blood lead test, the resultant **blood lead level**, and whether or not the worker's blood lead level is "**OK**" or "**ELEVATED**".

Records:

Auditor shall review the blood lead level notification log detailing the above information to ensure that he/she was properly notified.

Corroborative Evidence:

- Record review shall confirm that the workers have been properly notified of their blood lead levels.
- Auditor shall interview a small sample of workers to confirm that they have been properly notified as to their blood lead levels.

Indicator

2.5.d. Blood lead levels of workers shall not exceed **40 µg/dl** for men and **30 µg/dl** for women. Workers with a blood lead level exceeding the level specified above shall be temporarily relocated from work having an exposure to airborne lead that exceeds 10 µg/m^3. During this relocation period the worker shall maintain the same rate of pay, working hours, and benefits that he/she was previously afforded.

Workers with blood lead levels exceeding **40 µg/dl** for men and **30 µg/dl** for women shall be removed from their current position and temporarily relocated to a work area with airborne lead levels that do not exceed 10 µg/m^3. Relocation areas with lower exposure should not be contiguous to any production areas. For example a relocation area can be a warehouse separate from the production building. If the worker is transferred to an area that is contiguous with production areas, the facility must conduct air sampling in accordance with Criteria 2.2 to ensure that airborne lead levels do not exceed 10 µg/m^3.

It must be made aware that should local regulatory requirements for blood lead levels be more restrictive, then the applicable regulatory standard shall take precedence and become the de facto requirement in that jurisdiction.

The facility must also maintain a Medical Removal Summary Log that summarizes date of removal, blood lead levels, and area worker is transferred to (see Table 2.5-2).

Table 2.5-2
Medical Removal Summary Log

Medical Removal Summary Log							
Date Removed	**Employee Name**	**Work Area**	**BLL (µg/dl)**	**Reassigned Work Area Location**	**Air Lead Level (µg/m3)**	**Date Returned to Work Area**	**BLL (µg/dl)**
15/03/07	John Doe	Casting	45	Charging	5 µg/m3	30/04/07	35
15/03/07	Jim Smith	Oxide	52	Charging	5 µg/m3	15/05/07	37

Abbreviations:
BLL = Blood Lead Level

Workers who are temporarily removed from their work area to an area of lower lead exposure shall not be penalized with any loss of earnings, seniority, or other employment rights or benefits.

Records:

Review the medical removal summary log detailing the information provided in Example 2.5-3 and air monitoring records, if required, showing that the areas to which workers are removed are below the 10 µg/m^3 limit.

Corroborative Evidence:

- Record review shall confirm that the facility has temporarily removed workers with blood lead levels exceeding 40 µg/dl for men and 30 µg/dl for women.
- Record review shall confirm that areas of worker relocation are low lead exposure areas with levels below 10 µg/m^3.

Indicator

2.5.e. Workers relocated from working around lead due to a blood lead level at or above 40µg/dl for men and 30 µg/dl for women shall be eligible to return to work when two consecutive blood sampling tests taken 10 days apart for men and three consecutive blood sampling test taken 10 days apart for women indicate that the worker's blood lead level is at or below 35 µg/dl for men and 25 µg/dl for women. In no case shall the worker be returned to work within 30 days of the date of medical relocation.

Once a worker has been removed from their normal work position due to elevated blood lead levels, the following steps are designed to ensure that the before the worker is returned to his/her normal work station that their blood lead levels are below the mandated levels as stated above.

(1) Workers with elevated blood lead levels will have their blood lead level tested at least once per month in accordance with Indicator 2.5.b.
(2) Workers will be notified of blood lead levels upon receipt of laboratory results.
(3) After receiving test results indicating that the worker's blood lead has dropped at or below 35 µg/dl for men and 25 µg/dl for women, blood lead testing must be repeated after a minimum waiting period of 10 days. .
(4) After the second confirmatory test indicates that the worker's blood lead level has returned to the specified level, the worker may be assigned to their original work area without any loss of pay or seniority as stipulated.

Records:

Auditor shall review records of those workers who have been medically relocated. Records should include the following information:

- Worker's name;
- Date of medical relocation and corresponding blood lead level;
- Laboratory test results of blood lead level testing;
- Laboratory test results of two consecutive (at least10 days apart) blood lead level tests for men at or below 35 µg/dl for men and/or three consecutive (at least 10 days apart) blood level tests for women at or below 25 µg/dl**;**
- Date worker was returned to their initial work area.

Corroborative Evidence:

- Record review shall indicate that workers medically relocated have received appropriate follow-up blood lead level testing. Records shall also indicate that workers have been

returned to their initial work areas only after laboratory records indicate that blood lead level tests are below applicable levels.

Criteria 2.6: Facility shall institute a medical surveillance program

Indicator

2.6.a. Make the employment of workers conditional upon the following factors:

- A medical examination under the supervision of a licensed physician before the worker enters employment.
- A periodic medical examination at least annually.
- A signed certification by the licensed physician following each examination indicating that the worker may work around lead and other hazards with or without limitations as specified and may wear a negative pressure respirator (if assigned). Such certificates should be kept on file by the employer.

The Medical Surveillance Program must be performed by, or under the supervision of a licensed physician. At a minimum, the examination must contain the following elements:

- Detailed occupational history to include current and all previous employment;
- Detailed medical history including all previous surgeries, hospitalizations, and reproductive history;
- Detailed list of current complaints with particular attention to issues such as loss of appetite, fatigue, weight loss, shortness of breath, and muscle and joint aches and pains;
- Detailed physical examination emphasizing neurological, gastrointestinal, and cardiovascular systems;
- Blood pressure measurement;
- Evaluation of pulmonary function if respiratory equipment is used by worker;
- A Complete Blood Chemistry (CBC), including:
  - Hemoglobin,
  - Hemotocrit determinations,
  - Red Blood Cell indicies,
  - Examination of peripheral smear morphology,
  - Blood Urea Nitrogen, and
  - Serum Creatine;
- Any laboratory or other test relevant to lead exposure which the examining physician deems necessary by sound medical practice;

- A pregnancy test or laboratory evaluation of male fertility, if appropriate; and
- A review of the workers blood lead level results.

The physician shall present his/her written findings in a Medical Summary Report stating that they have reviewed the results of the most recent blood lead level testing and provide a medical opinion on whether the worker has any detected medical condition(s) that would increase the risk of impairment of the worker's health from exposure to lead. The physician's report will also include any restrictions or recommended protective measures should be placed on the worker. If a negative pressure respirator is to be assigned to the worker, the report should also indicate if there are any limitations restricting the worker from wearing a respirator.

The facility shall maintain a summary record detailing the workers name and signature, date of medical examination, date of previous medical exam (if applicable), name and signature of the examining or supervising physician, whether or not the worker is fit to work around lead, and the reason for the examination, i.e., annual or pre-employment exam, (see Table 2.6-1). Additionally, the facility shall have on file a copy of the examining physicians' license(s) or other required credentials.

Table 2.6-1
Worker Medical Exam Summary

WORKER MEDICAL EXAM SUMMARY						
Worker Name **Signature**	**Exam Date:**	**Previous Exam Date:**	**Physician Name** **Signature**	**Reviewed BLL? (Y/N)**	**Fit for work? (Y/N)**	**Reason for Exam?** (pre-employment, annual, or termination)
John Doe	01/03/07	01/03/06	Dr. J. Smith	Y	N	Annual
Joe Smith	01/03/07	/01/03/06	Dr. J. Smith	Y	N	Annual

Abbreviations:
BLL = Blood Lead Level

Records:

As part of the audit procedure, the auditor shall review the Worker Medical Exam Summary form as detailed above. In addition, review the physician's written opinion for compliance with applicable requirements.

Corroborative Evidence:

- Record review shall verify the dates when employees had required medical examinations to ensure examinations are accomplished at least annually.

- Auditor shall verify the credentials of medical personnel that are signing the medical certification to ensure that the process is being conducted or supervised by a licensed physician.
- Check that the forms signed by the examining physician contain the information as detailed above.

Indicator

2.6 b. Make available to workers upon termination or resignation one medical examination within 30 days at no charge.

If any worker is discharged or resigns within six months of the due date of the physical, an exit examination shall be made available at no cost to the employee in accordance with medical surveillance protocol outlined in *Indicator 2.6.a*. The employer should inform the employee in writing about where and when the examination will be made available

Records:

Auditor shall review records detailing:

- Employee discharge/resignation date and date of previous medical surveillance.
- Copy(s) of a written notification to worker of his/her right to an exit medical examination; or
- Physician's signed certification from such exam; or
- Evidence that the worker refused the exit examination.

Corroborative Evidence:

- Record review shall indicate that the facility has made available an exit medical examination for workers who have been terminated, or who have resigned.

Criteria 2.7: Facility shall take measures to prepare for an emergency and shall train all workers on the same.

In preparation for an emergency event, the facility shall develop and maintain a written Emergency Action Plan. Development and implementation of this plan is to ensure that all employees are thoroughly trained and ready for all emergencies that may arise within the facility.

Indicator

2.7.a. Ensure that the necessary information, internal communication, and coordination are provided to protect all people in the event of an emergency at the work area.

The facility developed Emergency Action Plan should include the following information:

- Facility evacuation routes clearly marked on floor plans of the site;
- A list of designated key employees and assignments during evacuation or other emergency;
- A designated central location for employees to gather in case of an evacuation; and
- Responsible individual who can be contacted for further information or explanation of duties under the plan.

In addition, the facility should post the following:

- Markings for facility evacuation routes;
- Emergency exit signs;
- Diagrams of the facility placed in easily viewed locations which show nearest exit; and
- A list of emergency telephone numbers by every telephone or communication system.

The facility must require employees to attend an Emergency Action Plan training session detailing the following:

- Explanation of facility escape routes,
- Chemical precautions (e.g., sulfuric acid) and fire hazards,
- Evacuation procedures and meeting place,
- Use of fire extinguishers and their locations,
- Location of emergency telephone numbers,
- Key personnel who will be in charge during an emergency, and
- Recognition of different alarm sounds (if applicable).

This training may be combined with the required health and safety training program.

Records:

As part of the audit procedures, the auditor shall review the following records:

- Facility's Emergency Action Plan,
- Employee training materials, and
- Training attendance records.

Corroborative Evidence:

- Record review and on-site visit shall confirm that the following:
  - Emergency Action Plan has been developed, implemented, and training provided,
  - All workers have been adequately trained on emergency procedures,
  - Workers are aware of actions to be taken during an emergency, and
  - Emergency exits are clearly marked, free of obstacles and unlocked.

Criteria 2.8: Facility shall have a formal program to train all workers on occupational safety and health issues and demonstrate awareness and compliance among workers.

Indicators

2.8.a. Require attendance of all workers at training courses.

Attendance at the safety training class is mandatory and must be well documented. Workers must sign and date an attendance sheet indicating that have attended the required training (Table 2.8-1).

Table 2.8-1
Health and Safety Training Attendance Sheet

Health and Safety Training Attendance Sheet			
Worker Name (Print)	**Worker Name (Signature)**	**Job Title**	**Date of Attendance**

Records:

Auditor shall review Health & Training Attendance Sheets (Table 2.8-1).

Corroborative Evidence:

- Record review shall confirm that workers have attended the mandatory health and safety training program.

Indicator

2.8.b. Each training course shall be conducted by competent persons and include the following information:

- The nature of operations that can cause lead exposures;
- The health effects of lead;
- The collection procedures and interpretation of personal air monitoring results;
- The purpose and description of the medical surveillance and blood lead monitoring programs;
- The engineering controls and work practices used to minimize exposures;
- The use, limitations, and fit testing of respirators; and
- Good personal hygiene practices and the potential for take home exposures.

The facility shall be required to conduct a mandatory health and safety training program conducted by a competent person with the appropriate experience to conduct such a course. Instructor's experience should include, professional background in battery manufacturing, completion of course(s) in the field

of lead hazards and/or industrial hygiene, and previous experience teaching health and safety training programs.

The health and safety training program shall be provided to all workers free of charge and during regular working hours. Should training be conducted on the weekend or any other time not considered as normal working hours, workers should be compensated for such time.

Health and safety training and instruction shall be provided as follows:

- When new employees are hired;
- When new substances, process, procedures or equipment is introduced to the facility and represent a new hazard;
- When the employer becomes aware of new or previously unrecognized hazards; and
- Annually to all workers as a mandatory refresher course.

The health and safety training instruction must be a minimum of four hours in length and must include the information outlined below.

I. Introduction

II. Facility Operations with Potential Lead Exposure
   a. Oxide and Grid Processing
   b. Plate Casting and Processing
   c. Battery Assembly
   d. Facility Maintenance

III. Health Effects of Lead
   a. Exposure Routes
   b. Inhalation
   c. Ingestion
   d. Distribution and Storage in the Body
   e. Target Organ Effects
   f. Reproductive Effects

IV. Air Lead Monitoring
   a. Equipment
   b. Sampling Techniques
   c. Sample Results

V. Engineering Controls & Work Practices
   a. Exhaust Ventilation
   b. Supplied-Air Systems
   c. Good Housekeeping Practices
   d. Cleaning Practices

VI. Medical Monitoring Programs
   a. Blood Lead Level Monitoring
   b. Medical Surveillance

VII. Worker Protection
   a. Personal Protective Clothing and Equipment
   b. Wearing coveralls
   c. Use of goggles and face shields
   d. Respirator use
   e. Personal Hygiene Practices
   f. Work Clothes vs. Street Clothes
   g. Showering and Hand Washing
   h. Take Home Exposures

VIII. Review

Upon completion of this course workers should be able to:

1. Understand and be able to identify processes with potential exposures to lead and engineering controls to reduce exposures.
2. Understand and be able to identify health effects related to lead exposures in the work place.
3. Understand and describe work practices to help reduce exposures to lead dust.
4. Understand the purpose of personal protective equipment used to reduce exposures to lead
5. Understand and describe good personal hygiene practices.

Records:

The auditor shall review training materials used to train workers on health and safety issues. Auditor shall also review a record of the name and qualifications of the person conducting the training.

Corroborative Evidence:

- Record review shall indicate that competent personnel have trained workers, that training materials were appropriate and comprehensive, and that the required topics were covered.
- Interview a small sample of workers to confirm that they have been properly trained on the health and safety topics associated with working with lead exposures. Interviewing of the workers is one approach to evaluate the health and safety program. It is important that the auditor allow workers to say what they think about the health and safety training program. Asking open-ended questions can help accomplish this. Sample questions may include:

  - Do you know what hazards are in your work area, if so what are they?
  - Do you know the health concerns for exposure to lead?

- Do you know if there are engineering controls in place to reduce exposure to lead?

Indicator
2.8.c. Conduct training programs within 10 days of initial assignment and refresher training programs at least annually.

New hired workers are required to attend the training program within 10 working day of hire on date. Health and safety training will be given annually, as a refresher course, to each worker that is assigned to an area with lead exposure or has regular access to production areas. A Health & Safety Training Record will be kept to document that all workers have completed the required health and safety training program as well as documenting the anticipated date of the workers' annual refresher training (see Table 2.8-2).

Table 2.8-2
Health and Safety Training Record

Health and Safety Training Record					
Worker Name (Print)	**Worker Name (Signature)**	**Date of Previous Training**	**Instructor Name**	**Training Completion Date**	**Refresher Training Date**

Records:

The auditor shall review the Health & Safety Training Record as given in Table 2.8-2.

Corroborative Evidence:

- Record review shall indicate that all new hired employees have completed the mandatory health and safety training program.
- Record review shall indicate that employees are completing annual refresher training programs as needed.

Objective 3: Increase the adoption of sustainable practices in order to reduce the environmental impact of lead battery manufacturing by encouraging efforts to minimize waste, lower emissions, reduce energy and water consumption, and encourage environmentally sound recycling.

Criteria 3.1: All types of waste and emissions from the facility are reduced. Where possible, waste is recycled and re-used and any residual waste is disposed of in an environmentally responsible manner.

Air

Indicator

3.1.a. Ensure that the facility is in compliance with the most stringent national, state, or local requirements for air emissions. Conduct ambient air quality monitoring to ensure that values are less than the annual average standards (based on a minimum of 104 measurements in a year taken twice a week) as given below:

- Respirable Particulate Matter (PM10), **50 μg/m^3**
- NO_x **60 μg/m^3**
- SO_2 **60 μg/m^3**

Fugitive and stack emission from facilities can increase the level of PM10, NO_x, and SO_2 in the neighboring environment. Sulfur dioxide (SO_2) is a major air pollutant, commonly formed by the combustion of sulfur-bearing fuel. Oxides of nitrogen (NO_x) are formed mostly during high temperature combustion. They play an important role in photochemical smog-forming reactions and, in sufficient concentrations, are deleterious to health, agriculture, and visibility. High level of PM10 in the ambient air causes harmful health effects.

Facilities shall determine levels of PM10, NO_x and SO_2 in ambient air to ensure they meet specified limits, and qualified personnel shall conduct sampling and laboratory analysis. The following are sampling and analysis methods recommended for such determinations.

Monitoring of PM10:

Sampling collection and analysis shall be conducted according to the U.S. Environmental Protection Agency (U.S. EPA) Reference Method for the Determination of Particulate Matter as PM10 in the Atmosphere (U.S. EPA 40 CFR part 50, Appendix J) or an equivalent method approved by the national government.

In the U.S. EPA method, an air sample draws ambient air at a constant flow rate into a specially shaped inlet where the suspended particulate matter is separated into one or more size fractions within the PM10 size range. Each size fraction in the PM10 size range is then collected on a separate filter over the specified sampling period.

The filter's collection efficiency shall be greater than or equal to 99 percent for 0.3 µm particles at the sampler's operating face velocity.

Each filter is weighed (after moisture equilibration) before and after use to determine the net weight (mass) gain due to collected PM10. The total volume of air sampled, corrected to U.S. EPA reference conditions (25 C, 101.3 kPa), is determined from the measured flow rate and the sampling time.

The analytical balance used must be suitable for weighing the type and size of filters required by the sampler. The range and sensitivity required depends on the filter tare weights and mass loadings. Typically, an analytical balance with a sensitivity of 0.1 mg is required for high volume samplers (flow rates >0.5 m^3/min). Lower volume samplers (flow rates <0.5 m^3/min) require a more sensitive balance.

Monitoring of NOx:

Sampling collection and analysis shall be conducted according to a nationally or internationally recognized and accepted method. Several internationally recognized methods are available for NOx sampling and analysis, including the following:

- Chemiluminescence Method,
- Potassium Iodide Method, and
- Saltzmann Method

The U.S. EPA, *Measurement Principle and Calibration Procedures for the Measurement of Nitrogen Dioxide in the Atmosphere - Gas Phase Chemiluminescence Method* (U.S. EPA 40 CFR Part 50, Appendix F) is the preferred and recommended NOx sampling and analysis method in the United States.

In the U.S. EPA method, atmospheric concentrations of nitrogen dioxide (NO_2) are measured indirectly by photometrically measuring the light intensity, at wavelengths greater than 600 nanometers, resulting from the chemiluminescent reaction of nitric oxide (NO) with ozone (O_3). NO_2 is first quantitatively reduced to NO by means of a converter. NO, which commonly exists in ambient air together with NO_2, passes through the converter unchanged causing a resultant total NOx concentration equal to NO+ NO_2. A sample of the input air is also measured without having passed

through the converter. This latter NO measurement is subtracted from the former measurement (NO+ NO_2) to yield the final NOx measurement. The NO and NO+ NO_2 measurements may be made concurrently with dual systems, or cyclically with the same system as long as the cycle time does not exceed 1 minute.

NOx calibration shall be conducted using gas-phase titration or a NO_2 permeation device as specified by U.S. EPA 40 CFR part 50, Appendix F.

The European Union (E.U.), in accordance with the 1996 Framework Directive (96/62/EC), requires NO_2 monitoring methods suitable for measuring concentration in the range of 0 – 500 $\mu g/m^3$, with a sufficiently high accuracy. For daily, discontinuous point measurements of NO_2, two active methods, the potassium iodide method or the Saltzmann-method are used; however, the Saltzmann-method recommends a shorter sampling time and therefore is not recommended for use with these audit protocols.

The potassium iodide method centers on the absorption of NO_2 on sinter glass filters impregnated with potassium iodide. The NO_2 is absorbed and reduced to nitrite by the iodide on the filter. Nitrite forms on the filter and is extracted with deionised water and then determined spectro-photometrically with the Griess method.

For continuous point measurements of NO_2, the most commonly used and recommended method by the EU 1996 Framework Directive is the Chemiluminescence Method. As with the above U.S. EPA method, this method is based on the gas phase chemiluminescence reaction of NO with O_3, which produces stimulated NO_2 emitting light (chemiluminescence) at about 1,200 nm wavelength. Sampling and analysis procedures for this method are based upon U.S. EPA 40 CFR part 50, Appendix F.

Monitoring of SO_2:

Sampling collection and analysis shall be conducted according to a nationally or internationally recognized and accepted method. The U.S. EPA and the E.U. have preferred methods for SO_2 sampling and analysis, which include the following:

- Pararosaniline Method (U.S. EPA 40 CFR part 50, Appendix A) and
- ISO-6767 (TCM/Pararosaniline) and ISO-4219.

The U.S. EPA method, *Reference Method for the Determination of Sulfur Dioxide in the Atmosphere - Pararosaniline Method* (U.S. EPA 40 CFR part 50, Appendix A), is the preferred method in the

United States for the sampling and analysis for SO_2. In this U.S. EPA method, a measured volume of air is bubbled through a solution of 0.04 M potassium tetrachloromercurate (TCM). The SO_2 present in the air stream reacts with the TCM solution to form a stable monochlorosulfonatomercurate complex. During subsequent analysis, the complex is reacted with acid-bleached pararosaniline dye and formaldehyde to form an intensely colored pararosaniline methyl sulfonic acid. The optical density of this species is determined spectrophotometrically at 548 nm and is directly related to the amount of SO_2 collected. The total volume of air sampled, corrected to EPA reference conditions (25 °C, 760 mm Hg [101 kPa]), is determined from the measured flow rate and the sampling time. The concentration of SO_2 in the ambient air is computed and expressed in micrograms per standard cubic meter (µg/std m^3).

For 24-hour sampling, a polypropylene tube 32 mm in diameter and 164 mm long is used as the absorber. A glass impinger stem, 6 mm in diameter and 158 mm long, is inserted into one port of the absorber cap. The tip of the stem is tapered to a small diameter orifice (0.4 ±0.1 mm).

The temperature of the absorbing solution during sampling is maintained at 15° ±10 °C. Following sampling and, until analysis, the temperature of the collected sample is maintained at 5° ±5 °C.

Analysis is done by a spectrophotometer suitable for measurement of absorbances at 548 nm with an effective spectral bandwidth of less than 15 nm.

The E.U. recommends the use of reference method ISO-6767 (TCM/paraosaniline) – Determination of the mass concentration of sulfur dioxide in ambient air. This method is used in conjunction with reference method ISO-4219, *Determination of gaseous compounds in ambient air*, for the sampling of SO_2 with a normal sampling period of 24 hours. In the ISO-6767 method, a measured air sample is drawn through a solution of TCM, and the SO_2 present in the air is absorbed by formation of a dichlorosulphitomercurate complex. This sample solution is then treated with a solution of sulphamic acid to destroy the nitrite anion formed by the oxides of nitrogen present in the air. It is then treated with solutions of formaldehyde and acid-bleached parasosaniline containing phosphoric acid to obtain a pH of 1.76. Sulfur dioxide concentrations are then taken from a calibration graph on the basis of calibration gas mixtures.

Ambient air samples shall be analyzed by the following:

- A laboratory that is accredited by the respective National Accreditation Authority and/or other certifying body for environmental testing; or

- A contracted laboratory that provides a self-certification that the quality of the analytical results has an accuracy to a confidence level of 95 percent within plus or minus 5 percent; or
- An in-house laboratory provided that 10 percent of the samples are submitted to an independent accredited laboratory (which meets the criteria specified above) for analysis as duplicate samples for validation purposes.

The analytical data shall include at minimum the following information:

- Date sampled;
- Date analyzed;
- Quantitative result and applicable units;
- Method used, detection limit; and
- The associated quality assurance and quality control results.

Equivalent Methods:

There are several commercially available electronic instruments for the continuous determination of NOx and SO_2 in ambient air. However, the facility must ensure that these instruments meet the following requirements: (1) are recognized as equivalent methods by applicable regulatory agencies; (2) have an appropriate range of detection for use under this Criterion; (3) can provide readings in $\mu g/m^3$; and (4) the results can be adjusted to account for the specific conditions at the facility, i.e., temperature and pressure. Additionally, NOx analyzers should be in conformance with ASTM D 3824.

Records:

Review the following documents:

- ***Ambient Air Quality Monitoring Plan.*** Facilities shall develop and implement an ambient air monitoring program to monitor PM10, NOx, and SO_2 in the ambient air. Air samples shall be taken at the property line of the facility at least twice a week (24 hour monitoring).

  The monitoring plan shall describe sample collection and analysis procedures to include the following:

  (a) Sampling frequency,
  (a) Sampling design, equipment, and the number and location of samples;
  (b) Quality assurance procedures (including calibration),

(c) Sampling procedures,
(d) Sample labeling and container, and
(e) Laboratory analytical methods.

- **Ambient air sample results.** Data shall be reported from all analytical results of ambient air samples taken at the facility. The BEST Audit will review results from the last 12-month reporting period or since the previous annual audit.

- **Records of noncompliance and corrective actions taken.** Document each incident of noncompliance for PM10, NOx and SO_2 in ambient air, along with its respective corrective actions and the conditions attained thereafter.

- **Emission permit (if applicable):** The Auditor shall review the emission permit(s) for PM10, NOx and SO_2 of the facility if such permit(s) exist.

Corroborative Evidence:

- Records shall confirm that the facility implements an appropriate ambient air monitoring program and that the sampling frequency and design are adequate and representative of the facility's operation.
- Confirm that PM10, NOx and SO_2 in ambient air are measured at least twice a week (24-hr monitoring) at the designated sites according to the monitoring plan. Document and resolve any discrepancy in the measurement frequency or location.
- Ambient air sampling results shall indicate that the annual average of PM10 content in ambient air does not exceed **50 $\mu g/m^3$**, annual average of NOx does not exceed **60 $\mu g/m^3$**, and annual average of SO_2 does not exceed **60 $\mu g/m^3$**. The analytical data shall also be defendable and the analysis performed according to the approved methods and by a laboratory meeting the requirements stipulated above.
- A visual inspection by the auditor will be conducted to confirm that monitoring equipment is properly maintained and calibrated. Equipment operator shall demonstrate adequate knowledge of maintenance and calibration procedures and troubleshooting techniques.

Water

Indicator

3.1.b. Maintain operating logs, records, and analytical results of discharges of wastewater for - pH level.

Extreme pH levels have deleterious effects on fish and aquatic life. Applicable regulations or operating permits generally specify allowable pH levels for wastewater discharge. The facility shall ensure that permit or regulatory levels are met.

Records:

The BEST audit will include a review of the following documents:

- **The facility's site-specific storm water management control program and discharge permit** (if required by regulatory authority). The program should include water runoff management and spill prevention and response procedures. The drainage and water treatment systems plan should identify all discharge points. The facility should comply with the discharge permit received.

- **Wastewater sampling plan.** (see requirement in Indicator 1.1.c.) The various discharge points for waste water must be identified and classified for lead sources and, facilities must ensure that lead concentration in any waste water is not more than 0.1mg/l before discharge.

- **The operating logs, records, and analytical results of discharges of wastewater for pH level.** The pH reading should be taken at least once a month or as specified in the discharge permit. However, if wastewater is treated in batches, a minimum of one grab sample may be taken from each storage tank or other impoundments. Measurement shall be conducted at a time, place and manner so as most likely to be representative of the peak discharge. The records should include the following:

    1. Sampling locations;
    2. Time and date reading was taken;
    3. Quantitative result; and
    4. Personnel conducting the reading.

The pH of the sample is determined electrometrically using either a glass electrode in combination with a reference electrode or with a combination electrode. The measuring device is calibrated using a series of standard solutions of known pH as recommended by the manufacturer.

Sample collection and analysis shall follow the U.S. Environmental Protection Agency (U.S. EPA) procedure for pH in liquid and soil (Method 9040).

Samples shall be placed in a clean glass breaker using a sufficient volume to cover the sensing element of the electrodes and to give adequate clearance for the magnetic stirring bar.

Calibration shall be done prior to all sample analysis. A minimum of two primary or secondary standard buffers must be used. Buffers must be three or more pH units apart; Buffer readings must be within 0.05 pH units of buffer's true value. Calibration buffer solution must be checked after every 10 samples (minimum) and the differences between checks shall be $\leq \pm 0.1$ pH unit. Electrode(s) must be cleaned after each sample analysis.

- **Records of compliance with the discharge permit** (if required by local authority).

Corroborative Evidence:

- A visual inspection shall show that pH sampling and measuring equipments are properly maintained and calibrated.
- Equipment operator shall demonstrate adequate knowledge of maintenance and calibration procedures and troubleshooting techniques.

Solid Waste

Indicator

3.1.c. Deploy a systematic process for continual monitoring and recording of the quantities and types of all nonhazardous waste generated.

The purpose of tracking waste generation is to help the facility characterize its waste streams and to develop an effective waste minimization strategy. The facility shall make continuous efforts to reduce wastes. The monitoring records will provide evidence of the facility's waste reduction efforts over time.

Records:

Characterize all nonhazardous wastes by type and origin to include all significant sources from production processes, packaging, office, warehouse, food sources, or others. Any significant quantity of any ad hoc, one time waste generated shall be recorded. Prepare the following inventory from waste disposal records:

- **Waste characterization:** Characterize all sources of recurring nonhazardous solid wastes from the facility, the types of wastes from these sources, and whether there is potential for hazardous waste contamination.

- **Non-hazardous solid waste records:** These records shall report the volume or weight of waste generated from the facility. The reporting frequency to summarize waste disposal may be determined by the facility but should be tabulated monthly, quarterly, or annually to facilitate tracking. The facility should report recycled wastes separately.

  The records shall summarize waste generation in a spreadsheet to include the following information:

  - The measured volume or weight of wastes by category (e.g. paper, plastic, packaging, food,);
  - The sources within the manufacturing process and other facility operations that generate these wastes;
  - The reporting periods when waste quantities were generated;
  - Disposal destination (on- or offsite), name and location of disposal site; and
  - Name of the business or person(s) in charge of transporting waste for offsite disposal.

  The auditor will review waste records for the last 12-month reporting period or for the period since the last audit.

Corroborative Evidence:

- The record review shall confirm that the facility keeps a comprehensive list of all sources of nonhazardous waste and has tracked the quantities disposed for at least 1 year.
- Waste shall be weighed or container volumes tracked to accurately quantify waste streams. The facility's waste records shall contain all the information specified above. Any unusual change in waste quantities (large, sudden increase or reduction) shall be explained.

Medical Wastes

Indicator

3.1.d. Prepare and implement a plan for the effective handling and disposal of medical waste (if any is generated on site).

The facility shall develop and maintain a medical waste management plan to address all medical wastes generated by the required blood lead testing and other medical tests or procedures conducted at the site. The facility's medical waste management plan should include the following information:

- Name of the contact person at the facility for matters regarding medical waste;
- Types and estimated average monthly quantities of medical waste generated;
- The onsite medical waste treatment method used, if applicable;
- Specific procedures used for treating or processing medical wastes (if applicable);
- Storage and containment procedures for medical wastes;
- Name and business address of the registered hazardous hauler used by the facility to remove untreated medical waste removed from the site for treatment or disposal; and
- Name and business address of the offsite treatment and/or disposal facility that receives the medical waste, if applicable.

Provisions for storing medical waste at the facility shall include the following:

- Medical waste shall be contained separately from other waste at the facility. Sharps (including used syringes, glass, or sharp pieces of metal) may be placed in rigid containers with biohazard labels. Sharps containers shall be conspicuously labeled with the word "**SHARPS**."

Provisions for onsite treatment of medical waste at the facility may include the following:

- Simple chemical treatments, such as sodium hypochlorite, aldehydes, ammonium salts, and phenolic compounds, can be used to disinfect medical waste such as sharps on site.
- Workers conducting chemical treatment must wear appropriate protective equipment including goggles or face shield, rubber gloves, splash apron, and protective boots.

Onsite medical waste shall be stored in an area that is either locked or under direct supervision or surveillance. These designated storage areas shall be marked with the international biohazardous symbol or other appropriate signage indicating biohazardous material is present.

Records:

Review the facility's medical waste management plan with the required information. Also review medical waste disposal records.

Corroborative evidence:

- The record review shall confirm that the facility has developed and implemented a proper medical waste management plan according to the guidelines set forth above.
- Review the facility's Medical Waste Disposal and Transport Record to document all medical waste generated and disposed of by the facility (Table 3.1). The facility shall complete this record each time waste is to be transported.

Table 3.1
Medical Waste Disposal and Transport Record

Medical Waste Disposal and Transport Record						
Facility Name:				**Month/Year:**		
Date	**Waste Generated**			**Method of transport**	**Name of person transporting waste**	**Signature of person transporting waste**
	Sharps (kg)	**Other (kg)**	**Description**			

Hazardous Wastes

The facility shall track all hazardous waste streams and ensure their proper disposal. The facility's monitoring records help measure success of its continuous efforts to reduce the quantity of hazardous waste generated.

Indicator
3.1.e.i. Monitor the type and quantity of hazardous waste generated.

The facility shall record the volume or weight of the hazardous waste it generates, characterizing the waste by process, recurring vs. one time, and analytical test results (if required).

Records:

Review the following records:

- **Hazardous waste characterization:** Listed sources of recurring and one-time hazardous wastes generated at the facility, the types of wastes from these sources, container types and quantities, and storage location. Hazardous wastes include lead-bearing materials, baghouse waste, waste acid, sludge from production or emission control processes, and other wastes

deemed hazardous by applicable local, state, or national regulations. Materials to be recycled shall not be included in this inventory.

- **Hazardous waste summary:** Record and tabulate the volume or weight of wastes generated from the facility by origin and type. The reporting frequency to summarize waste disposal may be established by the facility but should be collated at least annually.
  The records shall include the following information:

  - Measured volume or weight of wastes by category (e.g. waste oil, baghouse waste
  - Sources within the manufacturing process that generate these wastes;
  - Accumulation date when wastes were generated or containerized;
  - Facility personnel in charge of handling and/or disposing of the wastes
  - Name of the business or personnel in charge of transporting waste for offsite disposal;
  - Disposal destination (on- or offsite), name, and location of disposal site; and
  - Date of final offsite disposal.

- **Hazardous waste analytical records:** Waste streams are tested for several purposes prior to disposal. In some cases regulatory requirements require waste characterization based on ignitability, pH, concentration and/or leaching characteristics depending on the nature of the material. In other cases analytical tests are performed to determine the type of required treatment or disposal, or even whether the material must be classified as hazardous. In the case of recurring waste streams, ongoing waste testing may not be necessary but initial or periodic testing may be required by applicable law. **Analytical records may include the following:**

  - Toxicity characteristic leaching results for lead waste;
  - Testing reports for ignitability, corrosivity, reactivity, or toxicity.

Toxicity characteristic leaching results for lead waste*:* For waste that local regulations do not explicitly classify as hazardous, and for wastes with a regulatory content or leachate threshold to be classified as hazardous, the facility shall perform the required tests. For lead contaminated waste, if there is a regulatory lead content threshold, the facility shall analyze the lead concentration. If there is no applicable regulatory requirement, a maximum lead content of 1,000 ppm or a leachate content of 5.0 mg/l will apply.

If a leachate test is required, perform the test and document the required analytical procedure. Leachate test shall be done using the *Toxicity Characteristic Leaching Procedure, test Method 1311*

from the U.S. EPA Publication SW–846 or an equivalent method approved by the national government. In this method, the leachate extract from a representative sample of the waste (solid or sludge) will be tested to determine the level of lead contamination.

Analytical results for other waste types: For other wastes that the local regulations do not explicitly classify as hazardous, the facility shall test to determine if the waste exhibits characteristics of ignitability, corrosivity, reactivity, or toxicity above the specified regulatory level. In addition, keep records of all analytical results for acidic or other wastes requiring treatment prior to disposal.

Corroborative evidence:

- The record review shall confirm that the facility keeps a comprehensive list of all sources of hazardous waste and tracks the quantities generated. The hazardous waste records must include all the information required above.
- The record review should confirms that all lead-containing materials disposed as nonhazardous wastes (if any) have a lead content below the limit set by the applicable local authority. Review will also show that other potentially hazardous wastes under local regulations, if disposed as nonhazardous wastes, are below limits set by the applicable local authority to be disposed as nonhazardous wastes.

Indicator

3.1.e.ii. Maintain all records and manifests regarding offsite disposal of hazardous wastes for at least 3 years and records regarding onsite disposal of hazardous wastes indefinitely. The facility shall retain records of all applicable transportation, disposal locations, and quantities of hazardous waste.

Records:

As part of the auditing process, review the following records for all waste disposed of during the past 3 years:

- **Offsite shipment hazardous waste manifests:** the facility shall keep a waste manifest for each shipment of hazardous waste from the facility. Each waste manifest shall include the following information:
  - Name, address, and contact number for the emergency contact of the facility and the waste generator ID assigned by local authority (if any).
  - Name of the waste and waste codes (if assigned by applicable authority).
  - Total quantity of the waste, container type, and number of containers.
  - Date of shipment.

- Tracking number of the manifest.
- Signature of the facility personnel handling the waste, certifying that the waste manifest accurately describes the shipment.
- Signature of the shipment receiver (transporter) certifying that the waste manifest accurately describes the shipment received and that the receiver is authorized to handle the shipment.
- Shipment receiver name, contact and, if applicable, identification number assigned by local authority.
- Hazardous waste management method (if treated prior to disposal)
- Name and location of disposal facility if different from transporter.

- **Third party permits:** the facility shall maintain copies of required permits for all disposal facilities where hazardous wastes have been shipped.

- **Onsite disposal hazardous waste manifests:** the facility shall keep indefinitely a waste manifest for each load of hazardous waste disposed on site. Only solid wastes generated on site shall be disposed in the onsite facility if permitted by the applicable regulatory authority. The manifest shall include the following information:
  - The specific site location for the onsite disposal facility and any permits or permissions provided by the local authority.
  - Tracking number of the manifest.
  - Name of the waste and waste codes (if assigned by applicable authority).
  - Total quantity of the waste, container type, and number of containers.
  - Date of onsite disposal
  - Signature of the facility person(s) handling the disposal, certifying that the waste manifest accurately describes the waste being disposed and the disposal is done properly following applicable permits and regulations.

Corroborative evidence:

- The record review shall confirm that the facility keeps waste manifests of all offsite hazardous waste shipments and its onsite disposal. All the manifests shall contain information specified above.
- A visual comparison of the manifests and the hazardous waste records required in Objective 3.1.e.i shall show consistency in the quantity and type of waste disposed. The permit review shall confirm that other facilities that are contracted to transport, treat, or dispose of hazardous waste from the site have the required permits to operate.

Indicator

3.1.e.iii. Restrict onsite disposal sites to solid waste and ensure that they meet all applicable local requirements, have sufficient security to restrict access, and have warning signs posted.

The storage of hazardous waste on site is limited to 1 year. Onsite disposal is restricted to solid hazardous waste generated at the facility if permitted under applicable local requirements. The appropriate storage of hazardous waste at the facility shall include the following:

- All hazardous waste shall be contained in closed containers. The container shall be compatible with the waste to prevent the waste from interacting or corroding the container. Waste acid shall be contained in non-corrosive tanks.
- Waste containers shall have labels with the name of the waste and the accumulation date.
- Hazardous waste must be stored in an area(s) designated for hazardous waste with appropriate warning signs and emergency phone numbers posted.
- Unblocked and adequate aisle space for emergency access.
- Fire control devices such as a portable fire extinguisher, foam producing equipment, automatic sprinklers, and a water spray system in the vicinity of any ignitable wastes. Water at adequate volume and pressure shall be maintained on site for water-hose stream in case of fire.
- Incompatible wastes stored at a distance from one another (e.g., strong acid and alkaline materials).

Records:

Detailed records are required for all onsite storage and disposal activities as outlined below.

- **Hazardous waste disposal permit:** The facility shall obtain a license or permit required by the applicable authority to dispose of hazardous waste on site. All regulatory or permit requirements must be in place and specify all details of the operation including, but not limited to, the following:
  - Location,
  - Size,
  - Site security,
  - Capping,
  - Lining, and/or
  - Monitoring wells.

- **Onsite disposal facility records:** These records shall report the volume or weight of hazardous waste disposed on site since the facility started its operation or started recording. Reports must be made at least annually.

  The records shall include the following information:
  - Location and depth of the onsite disposal site(s).
  - Depth of initial soil cover placed over hazardous waste.
  - Local permits and requirements applicable to the onsite disposal.
  - Security measures applied to the site (e.g., restricted access, warning signs).
  - Personnel in charge of disposal and disposal site.

Corroborative Evidence:

- The permit review shall confirm that the facility has all the required permits to dispose of hazardous waste (if applicable).
- The auditor's visual inspection should indicate that the facility limits the storage of hazardous waste to appropriate containers in a designated area(s) for 1 year. The record review shall confirm that the facility keeps comprehensive records of all onsite disposal of solid hazardous waste and that disposal records have all the required information. Quantities and manner of disposal follow applicable local regulations or site permit specifying the location, size, security, capping, lining, and/or presence of monitoring wells. The visual inspection of the onsite disposal location verifies that access is restricted and appropriate warning signs are displayed.

Chemical Storage and Handling

Indicator
3.1.f.i. Inventory and monitor the type and quantity of chemicals used and stored on site.

Proper inventory monitoring of chemicals can help the facility to track its chemical usage and discover loss, theft, and waste in a timely manner. Ongoing monitoring also helps estimate the amount of release in the event of an accidental leak or spill.

Records:

As part of the auditing process**,** review the following records:

Chemical inventory: the facility shall maintain a chemical inventory that lists all the chemicals stored or used on site for production, cleaning, maintenance, or other purposes in quantities greater

than 1 liter for liquid chemicals or 1 kg for solid chemicals. The chemical inventory is updated at least once a year and includes the following information in a spreadsheet or list format:

- The chemical name and the common product name (if applicable);
- An estimate of the maximum amount of the chemical present at any time during the preceding calendar year;
- The estimated average daily amount on site;
- A brief description of the type of storage container for the chemical; and
- The location(s) of the chemical at the facility.

Note: Elemental lead stored on site need not be included in the inventory, but lead oxide and other lead compounds at the site shall be included.

Corroborative Evidence:

- The record review shall confirm that the facility keeps an inventory of the chemicals used and stored on site in a spreadsheet or list format. The inventory must include all the information discussed above. A visual inspection of the chemicals stored on site shall show that the inventory is comprehensive and accurate with regard to approximate quantities and storage locations.

Indicator
3.1.f.ii. Ensure the integrity of aboveground and underground storage tanks with regular monitoring.

The purpose of this Indicator is to ensure that the facility's storage tanks are properly designed and protected and that the facility has monitoring plan(s) in place to check for the integrity of these tanks. Common causes of spills and leaks are holes from corrosion, failure of the piping system, overfill, equipment failure, and human operational error.

Spills and leakage from aboveground and underground storage tanks can cause significant environmental damage. Leaks from underground storage tanks can contaminate soil and pollute ground water. Accidental release of sulfuric acid from aboveground storage tanks can corrode adjacent equipment and is a serious health hazard. Chemical spills and leaks also result in financial loss for the facility.

Aboveground tanks: The facility shall have corrosive protection for aboveground storage tanks that contain corrosive chemicals. Options for corrosive protection include using non-corrosive materials for tanks, elevating tanks, resting tanks on continuous concrete slabs, installing double-walled tanks,

cathodically protecting the tanks, or a combination of these options. The containment area, and, relevant pumping and piping systems shall have corrosion=resistant coating.

Underground tanks: Underground storage tanks shall have spill protection, corrosion protection, and pipe damage and leak prevention.

Spill protection: Many releases at underground storage tank sites come from spills and overfill. Spills often occur at the fill pipe when the delivery truck's hose is disconnected. Although these spills are usually small, repeated small releases can cause environmental problems. These mistakes can be avoided by following standard tank filling practices (e.g., making sure there is room in the underground storage tank for the delivery, and the delivery driver must watch the delivery at all times during the process).

All underground storage tanks shall have a catchment basin (a bucket sealed around the fill pipe) to contain spills. To protect against spills, the basin should be large enough to contain a spill when the delivery hose is uncoupled from the fill pipe.

All storage tanks shall have overfill protection devices. The three main types of overfill protection devices: automatic shutoff devices, overfill alarms, and ball float valves.

Corrosion protection: All underground storage tanks shall have one of the following corrosion protection designs for the tank and the piping.

- Tank and piping completely made of non-corrodible material, such as fiberglass.
- Tank and piping made of steel with a corrosion-resistant coating and cathodic protection. A corrosion-resistant coating electrically isolates the coated metal from the surrounding environment. An asphaltic coating does not qualify as corrosion resistant.

Pipe damage and leak prevention for underground tanks: Tank piping for underground tanks is characterized as pressurized, suction, or gravity. The specific leak testing procedures for each are specified below:

Pressurized piping permits fuel to be pushed from the tank to the dispenser through pipes by using a pump located inside the tank. Often there is a pump head located above the tank inside a small sump or shaft. Pressurized piping must have a leak detection device that automatically shuts off, restricts flow, or sounds an alarm to indicate a leak. Mechanically operated valves test for pipe leaks each time a pump is turned on, whereas the electronic type

continuously monitors for piping releases. Electronic systems serve all leak detection requirements if these systems are tested and calibrated annually. For piping systems that do not have one of these devices, a pipe tightness test must be conducted annually using interstitial monitoring, groundwater monitoring, or vapor monitoring. These methods are explained further in the monitoring section.

Pipe tightness testing is conducted when the piping and tank are taken out of service and pressurized usually above the normal operating pressure. A drop in pressure over time (usually an hour or more) suggests a possible leak. Most pipe tightness testing is performed by an independent company specializing in this procedure.

Suction piping occurs when fuel is pulled from the tank to the dispenser through a pump located at the dispenser. Suction piping does not require a leak detection device if it has the following characteristics: (1) there is enough slope so that the product in the pipe can drain back into the tank when suction is released and (2) the pipe has only one check valve, which is as close as possible beneath the pump in the dispensing unit. If a suction line is to be considered exempt based on these design elements, the facility shall show installation or design documents of the piping as evidence.

Suction piping that does not match the characteristics noted above must either have monthly monitoring (interstitial, groundwater, or vapor monitoring) or pipe tightness testing conducted every 3 years. Pipe tightness testing for suction piping is the same for pressurized piping, described above.

Gravity piping*:* Gravity systems have no pump but instead rely on the downward slope of the piping to transport fuel or waste products to or from a tank. Generally, gravity piping connects a sink or drain inside a building to a tank outside the building. The product (most commonly used oil) is dumped into the sink or drains and flows into the tank by gravity.

Gravity piping should be secondarily contained (e.g., double-walled piping). The facility shall monitor the interstitial space electronically or manually at least monthly (see method below).

Abandoned tanks: Above ground tanks that remain out of service for a year or more will be emptied, cleaned, locked, and labeled "**Out of Service.**" The facility shall remove abandoned underground storage tanks from the ground or leave them in place. In both cases, the tank must be emptied and cleaned by removing all liquids, dangerous vapors, and accumulated sludge. If the tank is left in the ground, the facility must also fill it with a harmless, chemically inactive solid, such as sand.

Records:

As part of the auditing process, review the following records:

- **Aboveground Storage Tanks:**

  Aboveground storage tank monitoring plan: This document shall list aboveground storage tanks that contain chemicals (including petroleum products, acids, and other liquids) with a volume greater than 2.5 cubic meters (or 2,500 liters). The monitoring plan shall include the following information:

  - Storage tank locations, capacities, and designs,
  - Storage tank monitoring schedule and methods (visual inspection or taking volume measurements).

  Both outdoor and indoor storage tanks shall have secondary containment areas that contain spills and allow leaks to be easily detected, unless there is a drainage system that routes potential leakages and spills to a holding tank or to the facility's waste water treatment system. Secondary containment for aboveground storage tanks must be impermeable to the materials being stored. Containment can be in the form of berms, dikes, liners, vaults, and double walled-tanks.

  Monitoring records: The facility shall monitor aboveground storage tanks by visual inspection or by taking volume measurements at least once a year to ensure that they are not leaking. Areas to inspect shall include tank foundations, connections, coatings, tank walls, and the piping system. The facility shall keep records of all monitoring results in a spreadsheet listing tank location, date inspected, name of inspector, and inspection results.

  Records of all spill, leak incidents and corrective actions taken: Each incident of leakage and spill shall be documented along with corrective actions and the condition attained thereafter.

- **Underground Storage Tanks:**

  ***Underground Storage Tank Monitoring Plan*:** This document shall list all underground storage tanks (UST), their locations, their capacities, their contents. This monitoring plan shall describe the storage tank and piping monitoring schedule and procedures. The monitoring plan shall also specify how the underground storage tanks are protected from spill, overfill, corrosion, and piping damage. The monitoring plan shall list any underground tanks

that are no longer in operation.

If the underground tank does not have an automatic tank gauging (ATG) system, the facility shall conduct leak and spill detection for its underground tanks monthly using one of the methods described below or an equivalent method approved by the local regulatory authority.

ATG systems are devices that are permanently installed on site to monitor the underground storage tanks and provide inventory information and leak testing. These systems automatically gather data and trigger an audible/visual message system or alarm. The ATG measures the amount of product delivered into and dispensed from the tank for the purpose of inventory control. When the ATG is in a "test" mode for leak detection, no dispensing or delivery is allowed. Each ATG system requires a minimum waiting time, usually more than 3 hours, to complete a test. A test must be conducted at least once per week.

For tanks above 7500 liters in volume, one of the following monitoring methods shall be used at least once per month for tanks without ATG systems:

1. **Interstitial Monitoring***:* This method detects leaks in the space between the first and a second barrier. It can be used for underground storage tanks with double walls, fitted with internal liners, or with interception barriers. Interstitial monitoring can be done by a) visual and olfactory inspections of sumps connected to the double walled space; b) using a dipstick with a product-finding or water-finding paste to detect chemicals in the double walled space; c) monitoring changes in the level of brine in the space between the two walls when brine is used; and d) electronic sensors placed in the sumps or between the two walls of the tank.

2. **Groundwater Monitoring:** Groundwater monitoring senses the presence of liquid product floating on the groundwater. This method requires installation of monitoring wells at strategic locations in the ground near the tank and along the piping runs. To discover if leaked product has reached groundwater, these wells can be checked periodically by hand or continuously with permanently installed equipment. However, this method cannot be used at sites where groundwater is more than 6 meters below the surface.

3. **Vapor Monitoring:** Vapor monitoring measures either product fumes in the soil around the UST or special tracer chemicals added to the UST, which escape in order to check for a leak. This method requires installation of carefully placed monitoring wells. Vapor

monitoring can be performed manually on a periodic basis or continuously using permanently installed equipment.

4. **Statistical Inventory Reconciliation:** Statistical Inventory Reconciliation (SIR) analyzes inventory, delivery, and dispensing data collected over a period of time to determine whether or not a tank system is leaking. Each operating day, the product level is measured using a gauge stick or other tank level monitor. The facility must also keep complete records of all withdrawals from and all deliveries to the UST.

For tanks less than 7500 liter in volume: Methods 1 to 4 must be performed monthly. Alternatively, the facility can use manual gauging in combination with tank tightness testing for the first 10 years of tank life. However, when the tank is more than 10 years old, one of the four monitoring methods must be conducted monthly.

Manual gauging involves keeping the tank undisturbed for at least 36 hours each week, during which time the tank's contents are measured, twice at the beginning and twice at the end of the test period. Manual gauging requires the following:

- Once each week, the tank must go into a "quiet period" for 36 hours. During this time, nothing is added to, or removed from, the tank. At the beginning and end of the quiet period, liquid level measurements are performed. To ensure accuracy, each measurement must be done twice. The difference in volume from the beginning to the end of the quiet period must be 10 gallons or less.
- Once a month, the four weekly changes in tank volume (taking into consideration positive and negative numbers) must be averaged. This average must be 20 liters or less.
- If any weekly or monthly change exceeds the allowable amount, a leak is suspected and further action must be taken.

Tank tightness testing involves taking the underground storage tank out of service for a longer period while changes in level or volume over time are measured. An alternative method uses a sonic device and tracer gas to check for holes in the tank wall. Tank tightness testing must be performed every 5 years.

Monitoring records: these records include leak and spill monitoring results; records of recent maintenance, repair, and calibration of onsite leak detection equipment; and inspections and tests of the corrosion protection system (if applicable).

Records of all spill, leak incidents, and corrective actions taken: Each incident of leakage, serious spill, or pipe failure shall be documented along with corrective actions.

Corroborative Evidence:

- The record review shall confirm that the facility prepared and implemented monitoring plans to ensure the integrity of all storage tanks.
- The record review of the design and specification documents and your visual inspection must show that all the storage tanks are built with adequate design and protection, and that out-of-operation tanks are properly emptied and handled as indicated above**.**
- The documentation review will confirm that all spills, leaks or pipe/tank failures were addressed satisfactorily and in a timely manner.
- A review will confirm that personnel in charge of storage tanks have adequate knowledge of operation, monitoring, and emergency responses.

Indicator

3.1.f.iii. Provide instructions to all facility workers on safe handling of all hazardous materials used or stored at the facility.

Exposure to occupational hazards can be reduced and environmental impacts minimized if workers handle hazardous materials properly. This training supplements the required lead training program by providing workers with information on the safe handling of hazardous materials.

Records:

As part of the auditing process, review the following records:

- Training contents and materials, including the following:
  - List of all hazardous chemicals that are stored or used at the facility and their usual locations;
  - Hazardous nature of those chemicals (corrosive, flammable, toxic, reactive, infectious, carcinogenic);
  - Route of exposure and potential health hazards;
  - Overexposure symptoms and first aid procedures;
  - Protective equipment required to handle certain types of chemicals;
  - Safe handling, transferring, transporting practices;
  - Procedures to respond to accidents;
  - Contact phone numbers for emergency personnel; and
  - Evacuation plan (evacuation routes and assembly areas).

Auditor shall confirm that the facility requires all new workers to receive training on safe handling of hazardous chemicals in a language they understand. Hazardous materials training can be combined with occupational health and safety training for working around lead (see Criteria 2.8).

Training records review shall confirm proof of training given in the last 12 months; the records may include enrollment lists with workers' signatures.

Corroborative Evidence:

- The training curriculum shall confirm that the facility provides adequate instruction on safe handling of all hazardous chemicals that could be used or stored at the facility.
- Training records shall demonstrate that all new workers employed within the past year have received training/instruction in a language that is understood by the worker.

Indicator
3.1.f.iv. Ensure appropriate storage of chemicals.

Unsafe storage and labeling of chemicals can lead to accidents, leaks, spills, fire, and explosions. The purpose of this Indicator is to ensure that the facility stores its chemicals safely.

The auditor shall visually inspect the storage and labeling practices for all chemicals used or stored at the facility. The inspection shall confirm the following:

- All chemicals are properly labeled with the names of the chemicals;
- Hazardous chemicals have appropriate hazard warnings;
- Sulfuric acid is stored in a well ventilated area in closed, non-corrosive containers, away from water or strong alkalines/bases. Handling instructions and first aid procedures for sulfuric acid are posted near the storage shelves, cabinet, or tank.
- Flammable chemicals are stored away from ignition sources;
- Storage shelves and cabinets are strong and secure.

Corroborative evidence:

- A visual inspection shall show that chemicals are stored appropriately and have proper labels and warnings.

Criteria 3.2: Provide instructions to end users on safe handling and disposal of lead batteries.

Indicator

3.2.a. Display cautions related to battery usage and disposal on a permanent label legible on the product; the label must indicate the following through a graphic or text:

- A reminder to wear the appropriate personal safety equipment during battery maintenance or servicing (to ensure that all labels are clearly legible, the MINIMUM letter font size will be 6 point);
- The international warning symbol for acid and instructions explaining what first aid to apply in the event of an acid burn or a splash to the face and eyes;
- A local telephone help line number where safe disposal or battery collection information can be obtained in the local language;
- Statement that the battery casing material, metals, and alloys in the battery can all be recycled; with the Mobius loop prominently displayed;
- Indication of positive and negative terminals and the voltage of the battery;
- A battery marked as a "lead-acid battery;" and a statement that the battery must NOT be dumped into a landfill or municipal waste dump;
- Instructions to recycle the used lead acid battery properly when it is at the end of its useful life, including the contact details of the battery supplier or recycler for correct collection or disposal provisions;
- A bar code to indicate the name of the manufacturer, date of production, place of manufacture, battery type, and unique serial number for each battery.
- Information on any deposit or reward system for returning the used battery to a specific location;

To ensure proper use, maintenance, disposal, and recycling of lead batteries, the facility must provide the appropriate labeling information (detailed above) that will be affixed to all batteries manufactured. This information must be presented in a language that is appropriate for the purchaser of the battery.

Bar codes shall be developed and instituted by the manufacturer. The bar code on each battery will correlate to the required information listed above.

If the battery is intended for use in an Uninterrupted Power Supply (UPS) device designed for personal computer systems, an Internet address label should added for more information on safe disposal and recycling of the battery, in addition to the required information listed above.

Records:

Review example labels provided for each battery manufactured indicating that the facility has developed all of the appropriate labels to be affixed to all lead batteries. Also review a detailed description of the bar code information to ensure completeness.

Corroborative Evidence:

- The record review and onsite visit will confirm that the facility has developed and applied the appropriate labels for lead batteries and
- The onsite inspection will confirm that battery labels are being properly affixed before new batteries are shipped.

Criteria 3.3: Provide information to all communities, emergency response agencies, medical providers, and local governments within a five-kilometre radius of the facility on emergency response procedures in case of an accidental spill or release.

Indicator

3.3.a. Develop and disseminate awareness material in the local language indicating the necessary steps to be taken during an emergency situation including any accidental spills or releases.

To initiate community awareness, assess the potential for spills or releases that may present a hazard to communities outside the plant boundary, the facility shall consider hazards presented to fire fighters or other first responders in the event of an accident at the site. To do this, the facility shall begin by reviewing the chemical inventory, quantities, and storage locations at the site. Small quantities of chemicals stored at the site (less than 100 liters) need not be evaluated; however, quantities greater than 100 liters should be evaluated for their potential impact to the surrounding community. For each chemical stored in sufficient volume and with sufficient toxicity, volatility and/or flammability, develop a hazard summary sheet for notifying local authorities, which provides the following information (see the example below). For example, sulfuric acid, on site storage of quantities greater than 100 liters would require notification requirements under this criteria. The hazard summary sheet should include the following:

- Chemical name and properties
- Location within the facility and maximum quantity stored on site
- Potential hazards
- Public safety actions to be taken by facility personnel
- Emergency response procedures

Example Hazard Summary for Community Notification

Example Hazard Summary for Community Notification	
1. Chemical Identification	
Chemical Name:	**Sulfuric Acid**
Other Names:	**Oleum (Fuming Sulfuric Acid)**
Location:	Aboveground storage tank in Northeast corner of facility.
Quantity:	5,000 liters
Properties:	Poisonous/Corrosive/Toxic: Clear, colorless, oily liquid, very corrosive. Very low odor threshold/pungent smell. Nonflammable, but can cause other combustible materials to ignite.
2. Potential Hazards	
Human Health:	Sulfuric acid is very corrosive and irritating to the skin, eyes, and respiratory and gastrointestinal tracts. Breathing sulfuric acid mist can result in tooth erosion. Inhalation of Oleum can cause respiratory irritation. Drinking concentrated sulfuric acid can burn the mouth and throat, erode a hole in the stomach, and cause death. Sulfuric acid in the eyes can cause severe burns and possible blindness.
Ecological Health:	Sulfuric acid has moderate short-term and long-term toxic effects on aquatic animals. Sulfuric acid is very corrosive to and will burn plants, birds, or land animals exposed.[contact exposure, air exposure, or both?] Small quantities of sulfuric acid can be neutralized by the natural alkalinity in aquatic systems; however, larger quantities may lower the pH for extended periods.
Fire or Explosion:	➢ Sulfuric acid is nonflammable but may ignite other combustibles (wood, paper, oil, clothing, etc.). ➢ Sulfuric acid reacts with water (potentially violent), releasing corrosive and/or toxic gases. ➢ Flammable/toxic gases may accumulate in confined areas (basement, tanks, tank cars, etc.). ➢ Contact with metals may create flammable hydrogen gas. ➢ Containers may explode when heated or if contaminated with water.
3. Public Safety	
What to do immediately:	➢ CALL Emergency Response Telephone Number (Fire Dept. / Police Dept.).[the facility should insert the applicable number] ➢ Isolate spill or leak area in all directions for at least 50 meters. ➢ Keep unauthorized personnel away. ➢ Stay upwind; ventilate enclosed areas; keep out of low-lying areas.
Protective Clothing:	➢ Wear positive pressure self-contained breathing apparatus or other positive pressure full-face respirator. ➢ Wear chemical protective clothing that is specifically recommended for exposure to sulfuric acid. NOTE: It may provide little or no thermal protection. [so nothing can be worn for thermal protection?] ➢ Firefighter protective clothing provides limited protection in fire situations only; it is NOT effective in spill situations where direct contact with the substance is possible. [so nothing can be worn for chemical protection?]
Evacuation:	**SPILL**: ➢ Increase isolation distance in DOWNWIND direction (persons should evacuate in an upwind direction). **FIRE**: ➢ If tank, rail car, or tank truck is involved in fire, isolate [people?] for 800 meters in all directions; also consider initial evacuation for 800 meters in all directions. Move to UPWIND location if possible.

4. Emergency Response	
Containing a Fire:	**Small fires**: ➢ Dry chemical or CO_2 ➢ Move containers from fire area if you can do so without risk. **Large fires**: ➢ Flood fire area with large quantities of water, while knocking down vapors with water fog. If insufficient water supplies: knock down vapors only. **Fire involving Tanks/Rail Cars/Tank Trucks**: ➢ Cool containers with flooding quantities of water until well after fire is out. ➢ Do not get water inside containers. ➢ Withdraw immediately in case of rising sound from venting safety devices or discoloration of tank. ➢ ALWAYS stay away from tanks engulfed in fire.
Containing a Spill or Leak:	➢ Wear fully encapsulating, vapor protective clothing if no fire involved. [where is this stored?] ➢ Stay away from damaged containers or spilled material unless wearing appropriate protective clothing. ➢ Stop leak if possible without risk. ➢ Use water spray to reduce vapors. DO NOT directly spray water onto leaking container. ➢ Remove any combustible materials (wood, paper, oil, etc.) from spill area. **Small Spills**: ➢ Cover with DRY earth, DRY sand or other noncombustible material along with plastic sheeting to minimize spread of spilled material. ➢ Use a nonsparking tool [such as…] to collect material and place into a loosely covered plastic container for later disposal. ➢ Prevent spilled material from entering into drains, sewers, or confined spaces.
First Aid:	➢ Move exposed person(s)/victim(s) to fresh air. ➢ CALL Emergency Response Telephone Number (Fire Dept./Police Dept.). ➢ If victim is not breathing, give artificial respiration. DO NOT give direct mouth-to-mouth respiration as this may result in caregiver coming into contact with sulfuric acid. ➢ Administer oxygen (if available) if breathing is difficult. ➢ Remove and isolate clothing contaminated with sulfuric acid. BE CAREFUL not to come into direct contact with residual sulfuric acid on clothing. ➢ Immediately flush skin or eyes with running water for at least 20 minutes if there is contact with sulfuric acid. ➢ Avoid spreading sulfuric acid to other parts of the body. ➢ Keep victim(s) warm and quiet. ➢ Watch victims with inhalation or ingestion of acid as adverse effects may be delayed. ➢ Provide detailed information about exposure to medical personnel.

Arrange for notification to community fire, police, and other first responders likely to respond in the event of an accident or spill at the site. Provide the name and number of the facility's Emergency Coordinator and after-hour contact numbers. Additional information to be provided must include:

- "Hazard Summary for Community Notification" (see example above);
- Transportation routes of hazardous chemicals (e.g., sulfuric acid);
- A complete list of all chemicals and quantities stored on site. Facility map showing locations where hazardous chemicals are used and stored and their quantities;

- Description of emergency response procedures at the facility;
- Contact information for the community coordinator and facility coordinator(s) [is this different than the Emergency Coordinator?] in charge of implementing the plan;
- An outline of emergency notification procedures (e.g., warning siren); and
- Distribute this information to the local fire department, police department and hospital, and any other local Hazardous Materials Emergency services agency.

Notice to local residents may take several forms depending on local circumstances and proximity to residential dwellings or other businesses. At a minimum, the facility should install a communitywide warning system (e.g., siren) to be used in the event of a spill or release of toxic chemical(s) that may affect local residences or businesses. Distribute information on the use and operation of this system to the local community and employees.

Records:

Review the following records:

- Community awareness information;
- Hazard Summary for Community Notification (see above example).
- List of chemicals and quantities stored on site.

Corroborative Evidence:

- The record review shall confirm that the community awareness and emergency information is complete and current.
- The record review shall confirm that community awareness and emergency information is in the appropriate language(s).
- The onsite visit shall confirm that the facility Emergency Coordinator is aware of and in possession of emergency procedures and contact information.
- The onsite visit shall confirm that the community warning system, or warning siren, is functional.

Criteria 3.4: Conservation of natural resources by reducing water and energy consumption.

Water Consumption

Indicator

3.4.a. Record the use of water from all sources.

The purpose of this Indicator is to encourage water metering and recordkeeping in order to facilitate water conservation measures. Water consumption monitoring helps the facility uncover waste and

implement corrective actions. Recording total water consumption annually shall facilitate year-to-year comparisons and allow for benchmarking of water consumption per unit of battery production.

Water consumption records can be based on utility bills if metered. If the facility draws surface or underground water from its own sources, water metering must be in place to measure the withdrawal volume.

Records:
Record and report total volume of water withdrawn in cubic meters per year (m^3/year) from all sources. To facilitate benchmarking, the time period for the annual water consumption tabulation shall match the annual energy consumption record in Indicator 3.4.b, the annual greenhouse gas emission record in Criteria 3.5, and annual battery production record in Criteria 3.8.

Corroborative evidence:

- The record review shall confirm that the facility keeps track of its water consumption from all sources, meters water from public and private sources, and maintains ongoing records of total annual water consumption from the inception of the initial audit under the BEST Standard.

Energy Consumption

Indicator
3.4.b. Record the total energy use per month for the facility.

The purpose of this Indicator is to facilitate more careful tracking of energy consumption in order to achieve increased efficiency. Recording total energy consumption on an annual basis shall allow for year-to-year comparisons and for benchmarking energy consumption per unit of battery production.

The facility shall record its total energy use from all sources, including electricity, and from petroleum, fuel oil, coal or other fuel burned on site. Fuel consumed in offsite transportation shall not be included in the tabulation.

Direct energy consumption: To calculate the total direct energy consumption, the battery manufacturer must:

1. Compile all records of energy sources **purchased** by the facility for its own consumption including:
    - Coal
    - Natural Gas

- Fuel distilled from crude oil, including gasoline, diesel, liquefied petroleum gas (LPG), compressed natural gas (CNG), liquefied natural gas (LNG), butane, propane, ethane, etc.
- Biofuels
- Ethanol

2. Calculate the Total Energy Consumption in gigajoules (GJ) by converting the fuel quantity into gigajoules using the conversions provided in Table 2 below (from Appendix C). If more than one fuel is consumed repeat this step for each and add the values for all fuel types together.

Indirect energy consumption: Recording the amount of energy the battery manufacturer uses through the purchase of electricity, heat, or steam is required under this Indicator.

The battery manufacturer must compile records identifying the amount of energy purchased and consumed from sources external to the manufacturing facility (e.g., electricity, steam, and other forms of imported energy). Electricity consumption should be reported in kilowatt-hours (kWh). To calculate the amount of energy consumed from steam or other forms of imported energy, follow the procedures outlined above for direct energy consumption.

From Appendix C:

Table 2: Default emission factors based on Intergovernmental Panel Climate Change

A	B	C	D	E	F	G
Fuel Type	CO_2 Combustion Emission Factor	Average net calorific value	Average net calorific x CO2 combustion emission factor	Typical density (Derived)	F =(C * 1000) / E	G = B * F
	kg CO_2 / GJ (1)	GJ / litre (2)	Kg CO_2/litre	gram/cm^3 (2)	GJ/MT	Kg CO_2/MT
Gasoline / petrol	69.25	0.0344	**2.3822**	0.79	43.5633	3016.7559
Kerosene	71.45	0.0357	**2.5508**	0.81	44.0726	3148.9889
Diesel	74.01	0.0371	**2.7458**	0.90	41.3334	3059.0841
Distillate fuel oil No.1	74.01	0.0371	**2.7458**	0.84	43.9169	3250.2934
Distillate fuel oil No.2	74.01	0.0371	**2.7458**	0.84	43.9169	3250.2934
Residual Fuel oil#4	74.01	0.0379	**2.8050**	-	-	-
Residual Fuel oil#5	77.30	0.0397	**3.0688**	0.99	39.9497	3088.1149
Residual Fuel oil#6	77.30	0.0405	**3.1307**	0.99	40.7548	3150.3439
LPG	63.20	0.0249	**1.5737**	0.54	45.9736	2905.5300
Propane	62.99	0.0240	**1.5118**	0.51	47.2381	2975.5302
Coal (Bituminous)	94.53	0.03023GJ/kg	**2.8576 kg CO2/kg**	-	30.2300	2857.6419
Coal (Anthracite)	98.30	0.0286GJ/kg	**2.8114 kg CO2/kg**	-	28.6000	2811.3800

(1) Emission factors are from Intergovernmental Panel on Climate Change (IPCC), 1999, Volume 2, Section 1.

(2) Heating values are from American Petroleum Institute (API), 2001
Values in other columns are derived arithmatically except as noted.

Records:

The facility shall record energy consumption monthly and tabulate its total energy consumption use at least once a year. To facilitate benchmarking, the time period for the annual energy consumption tabulation shall match the annual water consumption record in Indicator 3.4.a, the annual greenhouse gas emission record in Criteria 3.5, and annual battery production record in Criteria 3.8.

Corroborative evidence:

- The record review shall confirm that the facility keeps track of its energy consumption from all sources and maintains ongoing records of total annual consumption from the inception of the initial audit under the BEST Standard.

Criteria 3.5: Develop, implement, and monitor a plan to reduce greenhouse gas emissions.

Indicator

3.5.a. Maintain a record of greenhouse gas emissions in tonnes of CO_2 or an equivalent on an annual basis to include direct and indirect sources.

The purpose of this Indicator is to encourage the adoption of a simple monitoring program for greenhouse gas emissions in order to benchmark the facility's continuous efforts to achieve reductions. The facility shall develop a plan to reduce greenhouse gas emissions from onsite operations, including battery manufacturing and office functions. Reporting of greenhouse gas emissions from transportation and other operations is optional. The facility shall demonstrate continuous efforts to reduce its greenhouse gas emissions.

Records:

As part of the auditing process, the auditor will review the following records:

- **Greenhouse gas emission reduction plan:** this plan shall identify potential reductions that the facility could make and outline steps to implement reductions.

- **Annual greenhouse gas emission records:** The facility shall calculate its annual greenhouse gas emission in tonnes of CO_2 equivalence from direct sources (fuel used on site) and indirect sources (electricity, heat or steam purchased). The calculation shall be presented in a spreadsheet with a clear description of methodology and inputs.

The facility can use the simplified model provided below or one of the following internationally recognized greenhouse gas emissions methodologies:

- Greenhouse Gas (GHG) Protocol Initiative from the World Business Council for Sustainable Development (WBCSD) and World Resources Institute (WRI) that is available at www.ghgprotocol.org. This model provides tools for calculating CO_2 emissions from mobile and stationary combustion sources and from electricity with historical emission factors for electricity sources provided for all countries.

- Climate Leaders GHG Inventory Protocol (U.S. Environmental Protection Agency) guidance on how to inventory and report GHG emissions Available at: http://www.epa.gov/climateleaders/resources/guidance.html.

- ISO 14064-1:2006 standard specifies principles for quantifying and reporting GHG emissions. It includes requirements for the design, development, management, reporting, and verification of an organization's GHG inventory.

Alternatively, a model for reporting GHG emissions is provided in Appendix C. An Excel spreadsheet containing this model is available on the Occupational Knowledge International website at www.okinternational.org.

To calculate greenhouse gas emission, the facility needs the following necessary inputs for the simple model provided in the Excel spreadsheet:

Part I: GHG emission from stationary combustion sources:

1. Type of fuel used (gasoline, petrol, kerosene, LPG, propane, etc);
2. The total quantity of fuel burned;
3. The average net calorific value of the fuel (the fuel supplier can generally provide this information or values provided in the Excel file can be used); and
4. The CO_2 emission factor of the fuel (provided in the Excel spreadsheet).

Part II: GHG emission from electricity purchased:

1. The electricity purchased (kWh) and
2. The CO_2 emission factor (grams CO_2/kWh), which is specific for the grid of each country or region.

The specific values for CO_2 emissions for electricity sources from various regions of India are provided in Appendix C.

For other countries, the grid emission factors are available from the Greenhouse Gas Protocol Initiative and from other resources listed above. Average net calorific values and the CO_2 emission factor of different fuels can also be found in these web sites.

Corroborative Evidence:

- The facility must demonstrate that it has a plan in place to reduce its greenhouse gas emissions. The facility calculates its annual green house gas emissions from direct and indirect sources with an acceptable methodology and keeps ongoing records of annual greenhouse gas emissions beginning with the initial BEST certification audit.

Criteria 3.6: Establish a mechanism to ensure the performance of a collection system for used batteries that is compliant with the Model BEST Take Back System in Annexe 1.

Lead battery manufacturers are in the best position to facilitate the collection of used batteries in order to allow for more efficient, environmentally sound recycling. Ultimately, improved collection and recycling will benefit manufacturers by increasing the supply of lead used in battery production. The purpose of this Indicator is to ensure that the facility implements a battery collection system that achieves the desired goals outlined in the Model BEST Take Back System.

The facility shall have personnel in charge of monitoring battery collection and agreements with bulk, military, and institutional customers, as well as with recycling facilities, to implement the battery collection program. Bulk, military, and other institutional customers purchase batteries from the manufacturer in bulk for their own uses and not for resale. These batteries are the easiest to track and capture at the end of their useful life. Battery manufacturers must also demonstrate that they can accurately track the collection of used batteries from the retail sector.

Records:

As part of the auditing process, the auditor shall check the following records:

- **Examples of sales or contract agreements with a bulk, military or institutional customer**: These examples shall include provisions detailing battery take-back, collection, transportation, price discount, transfer time in accordance with Annex 1 of the BEST standard.

- **Examples of sales or contract agreements with distributors, dealers, and retailers**: These examples shall include provisions detailing battery take-back, collection, transportation, price discount, and transfer time in accordance with Annex 1 of the BEST standard.

- **Agreements with recycling facilities:** The manufacturing facility shall have agreements with all recycling facilities that receive used batteries from the manufacturer's bulk, military, and institutional customers. The agreement shall stipulate that the recycling facilities may not sell, distribute, or transport the used batteries to any other location or entity.

Statement for each shipment from recycling facilities: Each shipment of used batteries that a recycler receives from bulk, military, and institutional customers shall be accompanied by a statement from the recycler stating that the recycler meets all guidelines and applicable regulations for environmentally sound management of used lead batteries. The facility shall keep these statements for all recycling facilities that they have under contract.

Corroborative Evidence:

- An interview shall demonstrate that the facility assigns personnel to ensure that of its battery collection system is compliant with BEST Annex 1. The record review shall show that the facility has the required provisions and agreements with bulk, military, and institutional customers and recycling facilities has the shipping statements from recycling facilities; and has the ability to track battery collection performance from retail outlets.

Criteria 3.7: Monitor suppliers and track the collection of used batteries to ensure compliance with the BEST Standard.

Indicator

3.7.a. Maintain a record of all sources of parts, chemicals, or other materials used in production of lead batteries, including the name, address, and contact information of the supplier. The quantity and source of lead purchased must be reported on an annual basis in a manner sufficient to determine the recycled content of all lead inputs.

The purpose of this Indicator is to maintain records of suppliers of parts, materials, and chemicals that go into battery production to ensure that all production facilities are in compliance with applicable portions of the BEST Standard. The facility must also be able to monitor the recycled content of lead inputs.

Records:

As part of the auditing process the auditor will review the following documents:

- **Supplier inventory**: This inventory shall list: a) all the suppliers that supply parts, chemicals, and materials that went into battery production in the past 12 months; b) parts and chemicals that they supplied, and c) supplier name, address, and contact information.

- **Lead input records:** These records shall report the total annual quantity of virgin and recycled lead ingots purchased (lead ingots purchased from primary and secondary smelters). The facility shall keep these annual records for all the years since receiving BEST standard certification.

Corroborative evidence:

- The record review shall show that the facility keeps an up-to-date inventory of suppliers with all the required information and can report the percentage of recycled lead utilized on an annual basis.

Indicator

3.7.b. Require all suppliers to comply with applicable portions of the BEST Standard and provide written verification that all suppliers are compliant with the BEST Standards based on an annual audit conducted by the manufacturer or its agent.

The purpose of this Indicator is to encourage increased oversight of the suppliers of parts, chemicals, and materials to ensure that they are manufactured or processed under comparable environmental and occupational health standards.

The facility or its contracted agent shall conduct an annual audit of all suppliers to ensure that they comply with applicable portions of the BEST Standard. The facility shall determine which portions of the BEST Standard apply to suppliers that are providing components that do not contain lead. However, the BEST Audit Scoring Checklist should be used as a guide. The Checklist differentiates between the lead-related criteria and other environmental performance measures in the Standard. Suppliers of non-lead containing parts or chemicals should demonstrate compliance with these general environmental portions of the checklist. Audit records and reports should reflect compliance with these criteria.

Records:

As part of the auditing process the auditor will review the following documents:

- **Agreements with suppliers:** The facility shall have agreements with all suppliers requiring them to comply with applicable portions of the BEST Standard. These agreements can be part of the supply contracts or can be separate. They shall specify the portions of the BEST Standard that are applicable to each supplier and shall require them to comply with these portions in order to continue supplying the facility. These agreements shall also grant permission to conduct the supplier audit.

- **Supplier verification documents:** The facility shall keep a verification document for each supplier stating that an audit was conducted within the past year and the supplier was in substantial compliance with the applicable provisions of the BEST Standard. The verification documentation shall have approval signatures from the auditor and from the supplier's authorized personnel. Only suppliers who meet these requirements can continue supplying parts, materials, and chemicals for the facility.

Corroborative evidence:

- The record review shall show that the facility enters into agreements with all of its suppliers requiring them to comply with applicable portions of the BEST Standards; and that all of its suppliers have passed the annual audit conducted by the facility or its agent within the past year.

Indicator

3.7.c. Provide access with 15 days notice to facilitate audits of all suppliers' facilities where they manufacture lead-based components or parts of any supplied battery for the purpose of conducting an audit according to this standard.

The purpose of this Indicator is to ensure that the businesses that supply lead-based parts and components to the facility have sound environmental and occupational health performance that is independently verified. Where Indicator 3.7.b. requires all suppliers to meet "second party" audits conducted by the battery company, this Indicator holds lead-containing parts suppliers to a higher standard with a "third party" audit. This Indicator also helps create a level playing field between battery manufacturing facilities that manufacture all parts and components in-house and facilities that outsource parts of the battery production by ensuring that all are given similar scrutiny.

The facility shall require all of its lead-based battery parts and components suppliers to provide access for independent auditors with 15 days notice.

Records:

As part of the auditing process the auditor will review the following documents:

Agreements with suppliers: The facility shall have agreements with all businesses that supply lead-based battery parts and components, requiring them to provide access to independent auditors to conduct an annual audit with 15 days notice. These agreements can be part of the supply contracts or can be separate agreements. They shall stipulate that only the suppliers that pass the annual independent audit shall continue supplying to the facilities.

Corroborative evidence:

- The record review shall show that the facility enters into agreements with all of its lead-based parts and components suppliers requiring them to provide access to BEST auditors.

Indicator

3.7.d. Record the volume of used batteries collected from dealers or directly from customers and the release or sale of used batteries to registered recyclers with operating smelters for recycling.

The purpose of this Indicator is to benchmark battery collection efforts and demonstrate compliance with minimum collection provisions.

Records:

As part of the auditing process the auditor shall review the following documents:

Battery collection records: The facility shall report the number of batteries collected and sent to recyclers on a half-yearly basis with the reporting periods being October through March and April through September. The percentage of batteries collected shall be at least 20 percent of the batteries sold annually. To calculate the percentage collected, the facility should average the total of all batteries collected during the two previous 6-month reporting periods and divide by the average of all batteries produced or sold as reported in Criteria 3.8. The average for both periods shall be at least 20 percent of the number of batteries sold. The timing of the reporting periods for battery collection and battery sales in Criteria 3.8 shall correspond with each other. The annual collection rate at each audit shall increase at least 20 percent from the collection rate reported from the previous year until the target of 90 percent overall collection is achieved.

The collection and recycling record shall include the following information:

- Name and address of the qualified recycling facility;

- Number of batteries of each type collected during the 6-month reporting period as per Table 3.7;
- Number of batteries of each type sent to recyclers during the 6-month reporting period as per Table 3.7;
- Name and address of the designated collection centers;
- For each qualified recycling facility, the registration number, permit number, business license, or copy of other required permits to operate.

Table 3.7-1
Record of Batteries Collected and Sent to Qualified Recycling Facilities

Reporting period: From _____ To _____							
Number of Batteries	**Automobile**	**Two wheeler/ Three wheeler**	**Truck/ Bus**	**UPS Industrial**	**UPS Residential /Office**	**Motive**	**Others (Inverters, etc.)**
Collected							
Sent to recyclers							

Abbreviations:
UPS: Uninterrupted Power Supply.

Corroborative evidence:

- The record review shall confirm that the facility records the number of batteries sold and collected every 6 months. The reporting period should be from October through March and April through September. The battery collection records shall have the information shown in Table 3.7.1. The number of batteries collected shall be at least 20 percent of the battery sale. The annual collection rate at each audit shall be at least 20 percent higher than the collection rate reported from the previous year until the collection rate exceeds 90 percent.

Criteria 3.8: Benchmark environmental performance against annual battery production.

Indicator
3.8.a. Report the number, size, and type of batteries produced on an annual basis.

The purpose of this Indicator is to ensure that the facility keeps track of its battery production or sales in order to benchmark environmental performance for water usage, energy usage, greenhouse gas emissions, and number of batteries collected for recycling, per unit of battery production.

Records:

As part of the auditing process, the auditor will check the following records:

Battery production records: The facility shall keep records of annual battery production or sales that match the biannual reporting periods applied in Indicator 3.7.d. The two biannual reports will be summarized to correspond with the time period for the annual water consumption records in Indicator 3.4.a, annual energy consumption records in Indicator 3.4.b, annual greenhouse gas emission record in Criteria 3.5, and battery collection records in Indicator 3.7.d to facilitate benchmarking. The records shall be maintained in a format similar to Tables 3.8-1 and 3.8-2 (Appendix B) and include a breakdown of battery types as specified:

Table 3.8-1
Record of NUMBER of Batteries Sold

Reporting period: From _____ To _____							
Number of Batteries	**Automobile**	**Two wheeler/ Three wheeler**	**Truck/Bus**	**UPS Industrial**	**UPS Residential /Office**	**Motive**	**Others (Inverters, etc.…)**
Bulk and Institutional Sales							
Original Equipment Manufacturers							
Replacement (include wholesale and retail)							

Abbreviations:
UPS: Uninterrupted Power Supply.

Table 3.8-2
Record of WEIGHT of Batteries Sold

Reporting period: From _____ To _____							
Total Weight (Metric Tones)	**Automobile**	**Two wheeler/ Three wheeler**	**Truck/Bus**	**UPS Industrial**	**UPS Residential /Office**	**Motive**	**Others (Inverters, etc)**
Bulk and Institutional Sales							
Original Equipment Manufacturers							
Replacement (include wholesale and retail)							

Abbreviations:
UPS: Uninterrupted Power Supply.

Corroborative Evidence:

- The record review shall confirm that the facility keeps track of annual battery production or sales. Battery sales records shall have all the information shown in the tables above.

Criteria 3.9: Increase transparency through the disclosure of legal and administrative actions relevant to provisions of the BEST Standard.

The purpose of this Indicator is to increase transparency and facilitate full disclosure to auditors of potential environmental problems relevant to provisions of the BEST Standard originating at the facility. Such disclosure may help auditors identify possible patterns of exposure or other deficiencies at the site.

Indicator

3.9.a. Describe any material settlement or pending legal proceedings, other than ordinary routine litigations incidental to the business, that occurred or have been revealed in the past year to which the manufacturer or any of its subsidiaries are a party.

The facility shall provide all documentation summarizing civil or criminal litigation that relates to any provisions of the BEST Standard. Such disclosure shall include, but not be limited to, litigation concerning the discharge of materials into the environment or otherwise related to the protection of the environment or workers. This provision does not require the release of information concerning **ordinary routine litigation**, i.e., any legal action that does not relate to environmental or occupational operations, standards, laws, or practices. Litigation involving the discharge of materials into the environment or protection of the environment or workers shall not be deemed "ordinary routine litigation incidental to the business." Disclosure shall be made without regard to the known or anticipated monetary value of such legal proceedings.

Record:

As part of the auditing process, the auditor will check the following:

Documentation of pending or ongoing legal proceedings or settlements: The facility shall provide copies of relevant documents that summarize legal proceedings and/or legal settlements of any civil or criminal litigation during the past year. Such documents include, but are not limited to, pleadings, court filings, notices, orders, judgments, or settlements. Disclosure is required without regard to the status of insurance coverage against claims or settlements. The facility shall provide further detailed documents upon request.

Corroborative Evidence:

- Review all documents provided by the facility of all settlements or pending legal proceedings related to provisions of the BEST Standard over the past year. Request that the facility's authorized personnel readily disclose and discuss these documents as needed to clarify the information provided.

Indicator

3.9.b. Describe any material settlement, pending proceedings, fines, or violations concerning environmental or occupational laws and regulations advanced by a local, federal or state government, that occurred or were revealed in the past year to which the manufacturer or any of its subsidiaries are a party.

The facility shall provide all documentation that relates to any provisions of the BEST Standard and summarizes civil or administrative actions brought by any regulatory agency. Such disclosure shall include, but not be limited to, notices or actions concerning compliance with Federal, state, or local provisions on the discharge of materials into the environment or otherwise related to the protection of the environment or workers. These actions include settlements, proceedings, investigations, fines, and/or violation notices under local, state, or Federal law. Notices that the facility may be subject to, or in violation of, environmental regulations shall be included in such disclosure. This provision does not include other administrative actions that do not relate to environmental or occupational standards, laws, or practices. Workers Compensation claims, filings, and decisions are not included in the scope of this Indicator. Disclosure shall be made without regard to the known or anticipated monetary value of such administrative proceedings.

Record:

As part of the auditing process, the auditor will check the following documents:

Documentation of any settlements, legal proceedings, fines, or violations: The facility shall provide copies of relevant documents that summarize administrative settlements, legal proceedings, fines, or violations that occurred during the past year. Such documents include, but are not limited to, pleadings, court filings, notices, orders, judgments, or settlements. Disclosure is required without regard to the status of insurance coverage against claims or settlements. The auditor may request further detailed documents or explanations as needed.

Corroborative Evidence:

- Review all documents provided by the facility of all settlements or pending legal proceedings related to provisions of the BEST Standard over the past year. The facility's authorized personnel shall readily disclose and discuss these documents as needed to clarify the information provided.

Better Environmental Sustainability Targets
For Lead Battery Manufacturers

Annexure I
Battery Take Back System

Battery Take Back Provisions

(a) The manufacturer shall report the number of lead-acid batteries sold and the number of lead-acid batteries collected on a half-yearly basis.

(b) The manufacturer shall report the percentage of lead-acid batteries collected back per the number of lead-acid batteries sold for the same period.

(c) The manufacturer shall adopt measures to continually improve the rate of lead-acid batteries collected per the number of lead-acid batteries sold.

(d) The rate of lead-acid batteries collected per the number of lead-acid batteries sold shall increase by at least 20 percent per annum over the previous year until the target goal of 90 percent overall collection is achieved**.** A minimum collection rate of 20 percent must be maintained on an annual basis.

Bulk and institutional sales:

(e) The following governs the sale of lead batteries directly from participating manufacturers to bulk, government, military institutions, and/or for resale to these institutional customers:

1. No bulk, government, military, or other institutional customers purchasing batteries from participating manufacturers shall sell or dispose of a used lead-acid battery except by delivery to the agent of a battery manufacturer for delivery to a qualified recycling facility.

2. A participating manufacturer selling lead-acid batteries to bulk, government, military and other institutional customers shall include a provision in any sales agreement or contract for all lead-acid batteries sold requiring that:

    i. The purchaser store all used lead-acid batteries purchased under this agreement;
    ii. The purchaser notify the seller every 6 months of the approximate number of used batteries stored;

iii. The used batteries shall be relinquished to the seller at an agreed-upon date with a frequency of not more than 30 days after providing the above notice;
iv. The seller takes full responsibility for the cost of transporting used batteries from the storage location to a qualified recycling facility; and
v. The seller accepts from customer, at the time and location of transfer, used lead-acid batteries of the same general type and in a quantity at least equal to the number of new batteries purchased, if offered by customer.

3. The manufacturer shall accept ownership and provide transportation for one used lead-acid battery for each new lead-acid battery shipped.

4. The manufacturer accepting batteries in transfer shall be allowed a period not to exceed 30 days to remove batteries from the facilities.

5. The manufacturer shall provide a payment or price discount to the purchaser within 60 days of transferring batteries; the payment must be at least equal to the specified battery fee.

6. All batteries collected must be sold or relinquished to a qualified recycling facility under an agreement stipulating that the qualified recycling facility may not sell, distribute, or transport the used batteries to any other location or entity.

7. A participating manufacturer must obtain a sworn statement with each shipment from the qualified recycling facility that the shipment meets all guidelines and applicable regulations for environmentally sound management of used lead batteries by the appropriate federal, state, or local governing authority.

8. Participating manufacturers may establish arrangements with Consolidation Facilities to facilitate implementation of this provision.

APPENDIX A

BEST STANDARD AUDIT SCORING CHECKLIST

APPENDIX A

BEST STANDARD AUDIT SCORING CHEKCLIST

COMPANY: _____ SITE: _____

DATE: _____ LEAD AUDITOR: _____

Standard criteria	Lead - related Criteria Score as C/NC Requires all 24 Mandatory "C"	Other criteria Percentage Yes Requires 24 "C" of 30 total criteria (80%)
OBJECTIVE 1		
1.1.a. Measure the stack emissions every month for airborne lead and ensure that it does not exceed 10.0 mg/Nm3.		
1.1.b. Monitor lead content in ambient air twice a week (24 hr monitoring) and the values should be less than the standard of 1.0 µg/m3 as an annual average.		
1.1.c. Identify and classify potential lead sources from various discharge points for wastewater.		
1.2.a. Ensure that control equipment including, but not limited to, bag filters and scrubbers is in place and operational.		
1.2.b. Carry out performance testing of pollution control equipment at each stage of the process to ensure that it is functioning as intended and that such controls are adequate to minimize air emissions.		
1.2.c. Ensure that a stack, minimum height 30m, connected with hood and fan is in place and all the emissions from sources are routed through this.		

C = Conformance / NC = Non-conformance
Bold Criteria: Lead specific requiring 100% compliance.

Standard criteria	Lead - related Criteria Score as C/NC Requires all 24 Mandatory "C"	Other criteria Percentage Yes Requires 24 "C" of 30 total criteria (80%)
1.2.d. Ensure that control equipment is operating throughout when the manufacturing process is being carried out in areas serviced by this equipment.		
OBJECTIVE 2		
2.1.a. List processes and work areas with potential for worker lead exposure.		
2.1.b. Catalogue the controls being used by process and work area listed in 2.1.a above.		
2.2.a. Conduct full-shift personal air monitoring on workers and work areas with the greatest potential for lead exposure with a sufficient sample size and frequency necessary to provide representative data for each process and work area listed in 2.1a above.		
2.3.a. Install new or modify existing engineering controls (e.g., local exhaust ventilation) at machines, processes, or work areas where personal air monitoring results exceed 50 µg/m3 lead.		
2.3.b. Repeat personal air monitoring on workers in areas with new or modified production equipment or engineering controls to ensure that controls are effective and lead levels are maintained below 50 µg/m3.		
2.3.c. Require workers to wear respirators with a minimum protection factor in locations where the management has failed to maintain lead exposure levels equal to or less than 50 µg/m3 lead by other means.		
2.4.a. Provide daily clean coveralls or similar full-body work clothing to include gloves, caps, shoes (or disposable shoe coverings), and eye protection (if needed) to workers.		
2.4.b. Provide showers and hand washing facilities with soap and clean water.		
2.4.c. Require workers to wash hands with soap before each break and to shower at the end of each shift.		
2.4.d. Prohibit the consumption of food or drink in the workplace.		
2.4.e. Provide a separate eating area for workers that is removed or protected from the sources of lead exposure.		

C = Conformance / NC = Non-conformance
Bold Criteria: Lead specific requiring 100% compliance.

Standard criteria	Lead - related Criteria Score as C/NC Requires all 24 Mandatory "C"	Other criteria Percentage Yes Requires 24 "C" of 30 total criteria (80%)
2.4.f. Do not allow workers to enter eating areas without removing coveralls and washing their hands and face with soap and water.		
2.5.a Collect samples for blood lead analysis from all workers		
2.5.b. Obtain the services of a qualified phlebotomist, occupational physician, or nurse and arrange for blood lead analysis by a laboratory that is accredited by the respective National Accreditation Authority for biological/medical testing, which certifies that the reported results are accurate to a confidence level of 95 percent within plus or minus 5 percent. If blood lead analysis is conducted by an in-house laboratory, arrange for an independent accredited laboratory to analyze duplicates of at least 10 percent of the blood samples for validation purposes.		
2.5.c. Notify workers in writing of their individual blood lead levels within 5 working days of receipt of the results from the laboratory.		
2.5.d. Ensure that blood lead levels of workers do not exceed 40 µg/dl for men and 30 µg/dl for women. Workers with a blood lead level exceeding the level specified above should be temporarily relocated from work having an exposure to airborne lead that exceeds 10 µg/m3. During this relocation period the worker shall maintain the same rate of pay, working hours, and benefits that he/she was previously afforded.		
2.5.e. Workers relocated from working around lead due to a blood lead level at or above 40µg/dl for men and 30 µg/dl for women shall be eligible to return to work when two consecutive blood sampling tests taken 10 days apart for men and three consecutive blood sampling test taken 10 days apart for women indicate that the worker's blood lead level is at or below 35 µg/dl for men and 25 µg/dl for women. In no case shall the worker be returned to work within 30 days of the date of medical relocation.		
2.6.a. Make the employment of workers conditional upon an initial and annual medical examination under the supervision of a licensed physician documented with a signed certification		
2.6.b. Make available to workers upon termination or resignation one medical examination within 30		

C = Conformance / NC = Non-conformance
Bold Criteria: Lead specific requiring 100% compliance.

Standard criteria	Lead - related Criteria Score as C/NC Requires all 24 Mandatory "C"	Other criteria Percentage Yes Requires 24 "C" of 30 total criteria (80%)
days at no charge.		
2.7.a. Ensure that the necessary information, internal communication, and coordination are provided to protect all people in the event of an emergency at the work area.		
2.8.a. Require attendance of all workers at training courses.		
2.8.b. Ensure that each training course is conducted by a competent person and includes the required information.		
2.8.c. Conduct training programs within 10 days of initial assignment and refresher training programs at least annually.		
OBJECTIVE 3		
3.1.a. Conduct ambient air quality monitoring to ensure that values are less than the annual average standards (based on a minimum of 104 measurements in a year taken twice a week)		
3.1.b. Maintain operating logs, records, and analytical results of discharges of wastewater for pH level.		
3.1.c. Deploy a systematic process for continual monitoring and recording of the quantities and types of all non-hazardous waste generated.		
3.1.d. Prepare and implement a plan for the effective handling and disposal of medical waste (if any is generated on-site).		
3.1.e.i. Monitor the type and quantity of hazardous waste generated.		
3.1.e.ii. Maintain all records and manifests regarding off-site disposal of hazardous wastes for at least 3 years and records regarding on-site disposal of hazardous wastes indefinitely.		
3.1.e.iii. Restrict on-site disposal sites to solid waste and ensure that they meet all applicable local requirements, have sufficient security to restrict access, and have warning signs posted.		
3.1.f.i. Inventory and monitor the type and quantity of chemicals used and stored on-site.		
3.1.f.ii. Ensure the integrity of aboveground and underground storage tanks with regular monitoring.		

C = Conformance / NC = Non-conformance
Bold Criteria: Lead specific requiring 100% compliance.

Standard criteria	Lead - related Criteria Score as C/NC Requires all 24 Mandatory "C"	Other criteria Percentage Yes Requires 24 "C" of 30 total criteria (80%)
3.1.f.iii. Provide instructions to all workers on safe handling of all hazardous materials used or stored at the facility.		
3.1.f.iv. Ensure appropriate storage of chemicals.		
3.2.a. Display all required cautions related to battery usage and disposal on a permanent label legible on the product.		
3.3.a. Develop and disseminate awareness material in the local language indicating the necessary steps to be taken during an emergency situation including any accidental spills or releases.		
3.4.a. Record the use of water from all sources.		
3.4.b. Record the total energy use for the facility.		
3.5.a. Maintain a record of greenhouse gas emissions in tonnes of CO_2 or an equivalent on an annual basis to include direct and indirect sources.		
3.6: Establish a mechanism to ensure the performance of a collection system for used batteries that is compliant with the Model BEST Take Back System in Annex 1.		
3.7.a. Maintain a record of all sources of parts, chemicals, or other materials used in production of lead batteries including the name, address, and contact information of the supplier. The quantity and source of lead purchased must be reported on an annual basis in a manner sufficient to determine the recycled content of all lead inputs.		
3.7.b. Require all suppliers to comply with applicable portions of the BEST Standard and provide written verification that all suppliers are compliant with the BEST Standards based on an annual audit conducted by the manufacturer or its agent.		
3.7.c. Provide access with 15 days notice to facilitate audits of all suppliers' facilities where they manufacture lead-based components or parts of any supplied battery for the purpose of conducting an audit according to this standard.		
3.7.d. Record the volume of used batteries collected from dealers or directly from customers and the release or sale of used batteries to qualified recycling facilities.		

C = Conformance / NC = Non-conformance
Bold Criteria: Lead specific requiring 100% compliance.

Standard criteria	Lead - related Criteria Score as C/NC Requires all 24 Mandatory "C"	Other criteria Percentage Yes Requires 24 "C" of 30 total criteria (80%)
3.8.a. Report the number, size, and type of batteries produced on an annual basis.		
3.9.a. Describe any material settlement or pending legal proceedings, other than ordinary routine litigation incidental to the business, that occurred or has been revealed in the past year to which the manufacturer or any of its subsidiaries are a party.		
3.9.b. Describe any material settlement, pending proceedings, fines, or violations concerning environmental or occupational laws and regulations advanced by a local federal or state government, that occurred or were revealed in the past year to which the manufacturer or any of its subsidiaries are a party.		
TOTAL Conformance (C)		
TOTAL Non-conformance (NC)		

C = Conformance / NC = Non-conformance
Bold Criteria: Lead specific requiring 100% compliance.

APPENDIX B

TABLES

Table B-1
Lead Air Sampling Log

Lead Air Sampling Log							
Sample Number	**Date**	**Source Location (Personal/Area Sample)**	**Sample Description**	**Start Time (min)**	**Stop Time (min)**	**Flow Rate (lpm)**	**Analytical Result (µg/m3)**

Abbreviations:
lpm = liters per minute.
min = minutes

Table B-2
Lead Air Monitoring Log/Corrective Actions

Lead Air Monitoring Log Corrective Actions						
Date	**Sample Description**	**Number Samples Taken**	**Lead Air Results ($\mu g/m^3$)**			**What Corrective Action Was Taken As A Result?**
			Average	**Minimum**	**Maximum**	

Table B-3
Respirator Use Log

Respirator Use Log					
Name of Worker	**Production Area**	**Respirator Model**	**Size**	**Fit Test Method**	**Date of Fit Testing**

Table B-4
Employee Blood Lead Monitoring Log

Employee Blood Lead Monitoring Log							
Name/Job Title	**Employee ID**	**Gender**	**Date**	**Sample ID**	**BLL (µg/dl)***	**Reason for test?**	**Required Action?**

Abbreviations:
BLL = Blood Lead Level

Notes:
*If BLL exceeds 40 µg/dl for men or 30 µg/dl for women, they must immediately be followed under Medical Removal Program.

Table B-5
Medical Removal Summary Log

Medical Removal Summary Log							
Date Removed	**Employee Name**	**Work Area**	**Pre BLL (µg/dl)**	**Reassigned Work Area Location**	**Reassigned Air Lead Level (µg/m3)**	**Date Returned to Work Area**	**Post BLL (µg/dl)**

Abbreviations:
BLL = Blood Lead Level

Table B-6
Worker Medical Exam Summary

Worker Medical Exam Summary						
Worker Name	**Exam Date:**	**Previous Exam Date:**	**Physician Name**	**Reviewed BLL? (Y/N)**	**Fit for work? (Y/N)**	**Reason for Exam? (pre-employment, annual, or termination)**

Abbreviations:
BLL = Blood Lead Level

Table B-7
Health and Safety Training Attendance Sheet

Health and Safety Training Attendance Sheet			
Worker Name (Print)	**Worker ID**	**Job Title**	**Date of Attendance**

Table B-8
Health and Safety Training Record

Health and Safety Training Record					
Worker Name (Print)	**Worker ID**	**Date of Previous Training**	**Instructor Name**	**Training Completion Date**	**Refresher Training Date**

Table B-9
Medical Waste Disposal and Transport Record

Medical Waste Disposal and Transport Record					
Facility Name:				**Month/Year:**	
Date	**Waste Generated**			**Method of transport**	**Name of person transporting waste**
	Sharps (kg)	**Other (kg)**	**Description**		

Table B-10
Record of Batteries Collected and Sent to Qualified Recycling Facilities

Reporting period: From _____ To _____							
Number of Batteries	**Automobile**	**Two wheeler/ Three wheeler**	**Truck / Bus**	**UPS Industrial**	**UPS Residential /Office**	**Motive**	**Others (Inverters, etc.)**
Collected							
Sent to recyclers							

Abbreviations:
UPS: Uninterrupted Power Supply.

Table B-11
Record of Number of Batteries Sold

Reporting period: From _____ To _____							
Number of Batteries	**Automobile**	**Two wheeler/ Three wheeler**	**Truck / Bus**	**UPS Industrial**	**UPS Residential /Office**	**Motive**	**Others (Inverters, etc.…)**
Bulk and Institutional Sales							
Original Equipment Manufacturers							
Replacement (wholesale and retail)							

Abbreviations:
UPS: Uninterrupted Power Supply.

Table B-12
Record of Weight of Batteries Sold

Reporting period: From _____To_____							
Total Weight (Metric Tones)	**Automobile**	**Two wheeler/ Three wheeler**	**Truck / Bus**	**UPS Industrial**	**UPS Residential /Office**	**Motive**	**Others (Inverters, etc)**
Bulk and Institutional Sales							
Original Equipment Manufacturers							
Replacement (wholesale and retail)							

Abbreviations:
UPS: Uninterrupted Power Supply.

APPENDIX C

METHODOLOGY FOR GREENHOUSE GAS EMISSION REPORTING

APPENDIX C

Example Methodology for Greenhouse Gas Emission Reporting

In order to facilitate reporting greenhouse gas emissions, a simple model is provided in an Excel file available on the Occupational Knowledge International website at www.okinternational.org. The most significant greenhouse gas emitted from lead battery plants is carbon dioxide (CO_2). Therefore this simplified model only accounts for CO_2 emissions generated on site and electricity supplied to the facility. The Excel file includes a worksheet for calculating and combining CO_2 emissions from on site combustion sources and from electricity supplied from off site. Facilities must input information about fuels and electricity consumed into this worksheet to estimate greenhouse gas emission as described below:

STEP A. CO_2 from on site combustion

Open the Excel file named "CO_2 Model_2008". Go to the worksheet labeled **Table 1** - *Direct Emissions from Fossil Fuel Combustion* (illustrated below). Input the following information:

1. Type of fuel used (e.g. gasoline, petrol, Kerosene, LPG, Propane, etc) into column B.
2. The total quantity of fuel burned into column C.
3. Enter the value of "average net calorific value of the fuel *X* the CO_2 emission factor of the fuel" into column E as provided in column D of **Table 2** - *Fuel Emission Factors* (in the worksheet labeled **Table 2)**. In this Table, Column B provides CO_2 emission factors, column C lists average net calorific values, and column D provides the necessary input values for "average net calorific value x CO_2 emission factor".

   Note that your fuel supplier can also supply these values or you can reference other fuel specific values listed at http://www.natcomindia.org/

It may be necessary to add additional rows if more than two fuel types are consumed at the site. After you have entered the required information for each fuel type utilized at the site, the spreadsheet will provide the calculated greenhouse gas emissions in columns G and H. Note that column G reports the kg of CO_2, and column H the metric tones of CO_2 from each fuel source listed. The subtotal is provided in row 11.

Table 1: Direct Emissions from Fossil Fuel Combustion

A	B	C	D	E	F	G	H
Source description	Fossil Fuel type	Total quantity of fuel burned	Unit used to measure quantity of fuel use	Average Net Calorific value x CO2 Emission Factor	Unit of net calorific value	CO_2 emissions in (kg)	CO_2 emissions (Metric Tones)
				From Colum D in Fuel emission factors worksheet		G =C *E	H = G / 1'000
			litre		Kg CO_2/litre	0	0
			litre		Kg CO_2/litre	0	0
			litre		Kg CO_2/litre	0	0
			litre		Kg CO_2/litre	0	0
			litre		Kg CO_2/litre	0	0
				Subtotal	CO_2 emissions (MT) :		0

Table 2: Default emission factors based on Intergovernmental Panel Climate Change

A	B	C	D	E	F	G
Fuel Type	CO_2 Combustion Emission Factor	Average net calorific value	Average net calorific x CO2 combustion emission factor	Typical density (Derived)	F =(C * 1000) / E	G = B * F
	kg CO_2 / GJ (1)	GJ / litre (2)	Kg CO_2/litre	gram/cm^3 (2)	GJ/MT	Kg CO_2/MT
Gasoline / petrol	69.25	0.0344	**2.3822**	0.79	43.5633	3016.7559
Kerosene	71.45	0.0357	**2.5508**	0.81	44.0726	3148.9889
Diesel	74.01	0.0371	**2.7458**	0.90	41.3334	3059.0841
Distillate fuel oil No.1	74.01	0.0371	**2.7458**	0.84	43.9169	3250.2934
Distillate fuel oil No.2	74.01	0.0371	**2.7458**	0.84	43.9169	3250.2934
Residual Fuel oil#4	74.01	0.0379	**2.8050**	-	-	-
Residual Fuel oil#5	77.30	0.0397	**3.0688**	0.99	39.9497	3088.1149
Residual Fuel oil#6	77.30	0.0405	**3.1307**	0.99	40.7548	3150.3439
LPG	63.20	0.0249	**1.5737**	0.54	45.9736	2905.5300
Propane	62.99	0.0240	**1.5118**	0.51	47.2381	2975.5302
Coal (Bituminous)	94.53	0.03023GJ/kg	**2.8576 kg CO2/kg**	-	30.2300	2857.6419
Coal (Anthracite)	98.30	0.0286GJ/kg	**2.8114 kg CO2/kg**	-	28.6000	2811.3800

(1) Emission factors are from Intergovernmental Panel on Climate Change (IPCC), 1999, Volume 2, Section 1.

(2) Heating values are from American Petroleum Institute (API), 2001
Values in other columns are derived arithmatically except as noted.

STEP B. CO_2 from electricity supplied from off site

In the worksheet marked **Table 3** (*CO2 from Electricity Consumption)* enter the following information:

1. The source(s) (e.g. name of utility company) of the electricity purchased in column A and the Kilowatt hours consumed (kWh) into column B; and
2. Enter the CO_2 emission factor (in grams of CO_2 / kWh) into column C.

The CO_2 emission factor for electricity from different regions of India can be found in the Table 4 worksheet named "Grid Emission Factors". Countrywide emission factors for electricity sources in

other countries can be found at the Greenhouse Gas Protocol Initiative website at www.ghgprotocol.org.

Table 3: CO2 from Electricity Consumption

A	B	C	D
Source description	**Electricity Purchased (kWh)**	**CO_2 emission factor (grams CO_2/ kWh)** From Grid Emission Factors worksheet	**Indirect CO_2 emissions (Metric Tones)**
			0
			0
			0
Subtotal CO_2 emissions (MT) :			**0**

TOTAL CO2 Emission	**0 MT**

After the necessary values are entered, the total estimated emissions from electricity consumption would be automatically summed in metric tonnes of CO_2.

Note: If the facility produces its own electricity, use Table 1 to calculate emissions from fuels used to produce the electricity instead of Table 3.

Table 4: Grid specific emission factors for regions of India.

Grid	**States covered**	**Emission factor (gram of CO_2/KWh)**
Nothern Grid	Haryana, Himachal Pradesh, Punjab Jammu & Kashmir, Rajasthan, Uttaranchal Uttar Pradesh, Delhi	800
Western Grid	Gujarat, Madhya Pradesh, Maharashtra Goa, Chattisgarh	930
Southern Grid	Andhra Pradesh, Karnataka, Kereala, Tamil Nadu	750
Eastern Grid	Bihar, Orissa, West Bengal, Jharkhand	1190
North Eastern Grid	Arunachal Pardesh, Assam, Manipur, Meghalaya, Mizoram, Nagaland Tripura	360

Source: The Energy Research Institute (TERI) Report No. 2002RT64 submitted to MNES, GOI, NewDelhi November 2003

C. Total CO_2 emission:

After CO_2 emissions from fuels and electricity consumption are computed, the model will summarize the total CO_2 emissions from the facility in metric tones in row 24 of the worksheet "Input".

An example illustration indicating which cells require inputted data is shown in Figure 1 below.

Figure 1: Model Input Illustration

Example

Direct emissions from fossil fuel combustion

A	B	C	B	C	D	E	K
Source description	**Fossil Fuel type**	**Total quantity of fuel burned**	**Unit used to measure quantity of fuel use**	**Average Net Calorific value x CO2 Emission Factor**	**Units**	**CO_2 emissions in (kg)**	**CO_2 emissions (Metric Tones)**
						G=C*E	H=G / 1'000
Furnace	Diesel	3000	litre	2.75	Kg CO2/ Litre	8237	8
				Sub Total	**CO_2 emissions [tonnes] :**		**8**

INPUTS

From 'Fuel emission factors' worksheet, column D, Diesel

CO2 from Electricity Consumption

Region

Example
Karnataka

A	B	C	D
Source description	**Electricity Purchased (kWh)**	**CO_2 emission factor (grams CO_2/ kWh)**	**Indirect CO_2 emissions (tonnes)**
Office operations	1000	750	1

INPUTS

See Grid emission factors worksheet

TOTAL CO2 Emission **9 MT**