FACS
Forensic Analytical Consulting Services

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Industrial Hygiene Exposure Monitoring Work Plan

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SIGNATURE PAGE

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Acronym	**Definition**
%	Percent
µ	micron
µg	micrograms
ACGIH®	Formerly the American Conference of Governmental Industrial Hygienists
AIHA	American Industrial Hygiene Association
AL	Action Level
APF	Assigned Protection Factor
ASTM	American Society for Testing and Materials
β2 -M	Beta-2 microglobulin in urine
Be	Beryllium
BeLPT	Beryllium lymphocyte proliferation test
C	Ceiling
CAL/OSHA	California Division of Occupational Safety and Health
CAM-17	California Title 22 Metals
CBF	Chronic Beryllium Disease
CCR	California Code of Regulations
CDC	Centers for Disease Control
CdB	Cadmium in blood
CdU	Cadmium in urine
CHHSL	California Human Health Screening Levels
CIH	Certified Industrial Hygienist
CLIA	Clinical Laboratory Improvement Amendments
Co	Cobalt
COC	Contaminant(s) of Concern
CPR	Cardiopulmonary Resuscitation
Cu	Copper
DHHS	Department of Health and Human Services
DTSC	California Department of Toxic Substances Control
ELAP	Environmental Laboratory Accreditation Program
FACS	Forensic Analytical Consulting Services, Inc.
FEV_1	Forced Expiratory Volume in one second
FVC	Forced Vital Capacity
g/Cr	grams of creatinine
GFCI	Ground Fault Circuit Interrupter
HASP	Health and Safety Plan

Table 1: Abbreviations and Acronyms	
Acronym	**Definition**
HEPA	High Efficiency Particulate Air
Hg	Mercury
HPLC	High Performance Liquid Chromatography
IARC	International Agency for Research on Cancer
IDLH	Immediately Dangerous to Life and Health
IHLAP	Industrial Hygiene Laboratory Accreditation Program
JHA	Job Hazard Analysis
kg	kilogram
LDCT	Low Dose Computed Tomography
lpm	Liters per minute
MCE	Mixed Cellulose Ester
mg	Milligram
mg/kg	Milligrams per kilogram
mg/l	Milligrams per liter
mg/m3	Milligrams per cubic meter
mm	millimeter
Ni	Nickel
NIOSH	National Institute of Occupational Safety and Health
ºF	Degrees Fahrenheit
OSHA	Occupational Safety and Health Administration
Pb	Lead
PEL	Permissible Exposure Limit
PPE	Personal Protective Equipment
PPM	Parts Per Million
RCRA	Resource Conservation and Recovery Act
SDS	Safety Data Sheet
SFBRWQCB	San Francisco Bay Regional Water Quality Control Board
SPF	Sun Protection Factor
SSHM	Site Safety and Health Manager
STEL	Short Term Exposure Limit
STLC	Soluble Threshold Limits Concentration
SVOC	Semi-Volatile Organic Compound
TCLP	Toxicity Characteristic Leaching Procedure
TLV®	Threshold Limit Value
TTLC	Total Threshold Limit Concentration
TWA	Time-Weighted Average

Table 1: Abbreviations and Acronyms	
Acronym	**Definition**
TVOC	Total Volatile Organic Compounds
UL	Underwriters Laboratory
USEPA	United States Environmental Protection Agency
UV	Ultraviolet
ZPP	Zinc Protoporphyrin

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1.0 INDUSTRIAL HYGIENE MONITORING & SURVEILLANCE

1.1 Purpose

In order to ensure the health and safety of METech employees, Forensics Analytical Consulting Services (FACS) has prepared this industrial monitoring and surveillance work plan (Work Plan). The purpose of this Work Plan is to establish a monitoring program to ensure that personnel work in a safe and healthy work environment. This purpose is achieved by employing the principles of industrial hygiene. Industrial hygiene is the art and science of anticipation, recognition, evaluation, prevention and control of environmental hazards in the workplace. Industrial Hygiene is an essential component of environmental health and safety (EHS) management and is focused upon assurance of employee health protection in the workplace.

The Industrial Hygiene Work Plan will be used as a tool:

1. To assess potential employee exposure to chemical health hazards;
2. To organize and perform employee exposure monitoring in order to establish baseline post-remediation data and to regularly assess the efficacy of newly implemented control measures;
3. To assure employees are properly trained as to the potential health hazards in their work areas and the use of appropriate safe work practices and personal protective equipment;
4. To assure and demonstrate compliance with applicable regulations and guidelines;
5. To provide a general framework with possible options to accomplish the goal of an effective site Industrial Hygiene Monitoring program.

1.2 Essential Components

The essential components of the industrial hygiene monitoring work plan are:

- Identifying contaminants of concern
- Establishing exposure levels and site-specific action levels
- Exposure Monitoring
- Safe Work Practices
- Personal protective equipment
- Hazard communication
- Medical management
- Housekeeping.

Specific details of each of these components are provided in subsequent section of this document.

2.0 BACKGROUND

2.1 Site History

METech Recycling (METech) performs mechanical processing and separation of electronic waste. The facility is a permitted Covered Electronics Waste Collector and Recycler (SB Permit #101719). In August 2016, the California Department of Toxic Substances Control (DTSC) performed an inspection of the facility which included collecting of dust samples from surfaces in the shredder rooms and the eddy-current separator. Based on the results of TTLC (total Threshold Limit Concentration) and STLC (Soluble Threshold Limit Concentration) analyses of bulk dust samples, DTSC found that the levels of five metals in exceeded the aforementioned California regulatory thresholds stated in California Code of Regulations, Title 22, §66261.24(a)(2)(A): cadmium, cobalt, mercury, nickel, and zinc. The recycling facility's shredder operations were ordered shut down by the DTSC on September 23, 2016.

According to the DTSC, the shredder operations deposited dust into the air and onto the surface of equipment inside and outside the shredder room. The shredding and treatment of universal waste devices lack a containment device to prevent a release of hazardous waste dust and hazardous waste constituents.

In order to restart operations, DTSC required METech to submit a work plan that, among many other requirements, provided evidence that the floors, walls, and equipment surfaces were thoroughly cleaned and decontaminated.

2.2 Health and Safety Plan (HASP)

In response to the findings of DTSC's inspection, METech contracted Forensic Analytical Consulting Services (FACS) to develop a Health and Safety Plan (HASP) that would be followed during the planned dust remediation of the site. Within the HASP, FACS specified:

- A remediation scope of work
- Health hazard assessment and controls
- Physical hazards and controls
- An air monitoring program during remediation activities
- Specification for personal protective equipment
- decontamination procedures
- Medical surveillance requirements and
- Work area clearance (visual, air, and surface) criteria

The HASP was submitted to DTSC by METech for review and approval. After several revisions,

the HASP was approved by DTSC on January 20, 2017.

2.3 Baseline Industrial Hygiene Survey

In preparation for the planned remediation of contaminated dust, FACS conducted a baseline industrial hygiene survey that consisted of performing full shift stationary area air monitoring to determine the airborne concentrations of cadmium, cobalt, lead, nickel, and zinc particulates and mercury vapor throughout the facility on January 25, 2017. All air sample results were less than the applicable Cal/OSHA Permissible Exposure Limits (PELs) and Action Levels (ALs). Light dust deposits were observed on most horizontal surfaces. No visible mercury droplets were observed.

2.4 Remediation

Toxic dust remediation of the shredder and eddy Current areas was performed by MSE Environmental within containment as specified in the HASP. Remediation started on February 27, 2017 and was completed on May 22, 2017. Daily personal monitoring of remediation personnel and perimeter area air monitoring outside containment were conducted by FACS for the duration of remediation phase. During the remediation, FACS occasionally collected wipe samples from walls, floor, ceiling, and equipment surfaces in order determine efficacy of the clean-up effort.

2.5 Post-Remediation Verification Surveys (Clearance)

After remediation was completed by MSE Environmental, in accordance with the protocols stipulated in the HASP, FACS performed surface sampling of walls, floors, ceiling, and equipment surfaces for cadmium, cobalt, lead, mercury, nickel, and zinc contaminant residuals on May 23, 2017. Surface sample laboratory results were presented to DTSC officials at a meeting held at their Berkeley office on June 16, 2017. During that meeting, FACS stated that the surface clearance criteria developed for remediation of the METech areas were far too conservative and more appropriate to an office occupancy than an industrial facility. As was discussed and presented to DTSC, when a reduced safety factor was applied to the formula used to calculate surface clearance levels, the majority of the surface clearance test results met the recalculated clearance levels. Also discussed was the lack of correlation between surface contamination and airborne exposure was with the results of the Baseline industrial hygiene survey, conducted before commencement of the remediation phase, clearly demonstrating this point.

During the June 16, 2017 meeting, DTSC was informed that clearance air sampling would be scheduled upon their acceptance of the surface clearance sample results. As a result of the

meeting, DTSC approved proceeding with the industrial hygiene air clearance survey.

The June 23, 2017 industrial hygiene air clearance survey was conducted in METech's SSI-1 and Eddy current areas. Containment remained in place during this survey. The results of the clearance survey were:

- Airborne levels of mercury vapor met the clearance criterion stipulated in the HASP.
- Airborne levels of cadmium, cobalt, nickel, lead, mercury, and zinc particulates met the clearance criteria stipulated in the HASP.
- No mercury droplets were observed on surfaces.
- All debris and dust accumulations had been removed from floor, wall, ceiling, and equipment surfaces.

As a result of these findings, FACS concluded that environmental conditions cited by the DTSC that resulted in the shutdown of SSI-1 and the Eddy Current areas had been addressed and corrected. Accordingly, METech was advised that the remediation was successful.

3.0 EXPOSURE MONITORING

3.1 Purpose

This exposure monitoring work plan will establish a program that continually performs assessments that determine if environmental health hazards associated with operations at METech are adequately controlled, thereby reducing the risk of personnel developing work-related illnesses and diseases. Worker exposure monitoring is performed based on the principles of industrial hygiene. Industrial hygiene is the art and science of anticipating, recognizing, evaluating, preventing and controlling workplace conditions that may cause workers' injury or illness. Industrial hygienists use environmental monitoring and analytical methods to evaluate worker exposure. Air sampling for contaminants will be performed in the breathing zone of workers to evaluate their exposure to toxic agents produced by the recycling of electronic waste. Exposure monitoring results will be compared to occupational exposure limits and site-specific action levels. Site-specific health hazards, occupational exposure limits, action levels, and the exposure monitoring work plan are discussed below.

3.2 METech's Site Specific Health Hazards

The primary occupational health hazards posed to METech Recycling employees is exposure to toxic heavy metals dusts produced by the shredding of electronics. DTSC found that the levels of cadmium, cobalt, mercury, nickel, and zinc in the collected bulk samples exceeded California regulatory thresholds stated in California Code of Regulations, Title 22, section 66261.24(a)(2)(A). DTSC's findings apply to hazardous waste disposal, not occupational exposures. DTSC's report did not identify beryllium, copper, or lead which are three heavy metal contaminants associated with electronic waste.

Inhalation of dusts contaminated with heavy metals can elicit a variety of health symptoms, both short and long term, depending upon the duration of exposure, concentration of the contaminants, the specific metals in the dust, and personal factors of the exposed person. For example, cadmium and lead are systemic toxins that adversely affect major, but different organ systems. Each of the contaminants of concern elicits different toxic effects on different organ systems. Cumulatively, exposure to the identified contaminants of concern does not result in an additive health effect.

FACS has designated six metals as contaminants of concern at METech:

- beryllium
- cadmium

- cobalt
- copper
- lead and
- mercury

These metals will be included in the industrial hygiene air monitoring program. These metals were selected based on their:

- probable presence in electronic components,
- health effects and toxicity, and
- occupational exposure limits.

3.3 Occupational Exposure Limits

3.3.1 Cal/OSHA

Permissible exposure limits (PELs) for inhalation of airborne contaminants have been established by Cal/OSHA under Title 8 CCR Section §5155 *Airborne Contaminants*. The Permissible Exposure Limit (PEL) is the upper limit of permissible exposure to an airborne contaminant for any employee on any day. PELs may include "TWA" values (for 8-hour time weighted average exposures), "STEL" values (short-term exposure limits for 15-minute exposures), and/or "Ceiling" values (for peak exposures).

Comprehensive substance-specific standards have been established for beryllium (Title 8 §5205), cadmium (Title 8 §1532), and lead (Title 8 §1532.1) that include an "Action Level". The Action Level is the 8-hour average employee exposure level at or above which certain "actions" are required, such as respiratory worker training, medical surveillance, etc.

3.3.2 ACGIH

Cal/OSHA PELs, which are regulatory enforceable limits, are based primarily on Threshold Limit Values (TLVs®) recommended by ACGIH® (formerly the American Conference of Governmental Industrial Hygienists). However, ACGIH® TLVs® are updated more frequently. A combination of engineering controls, safe work practices, and personal protective equipment must be implemented, as required, to control exposures to below the TLV.

3.3.3 NIOSH

Immediately dangerous to life or health air concentration values (IDLH values) developed by the National Institute for Occupational Safety and Health (NIOSH) characterize the high-risk exposure concentrations and conditions and are used as a component of respirator selection criteria first developed in the mid-1970s. IDLH values are established (1) to ensure that the

worker can escape from a given contaminated environment in the event of failure of the respiratory protection equipment and (2) to indicate a maximum level above which only a highly reliable breathing apparatus, providing maximum worker protection, is permitted.

3.3.4 Action Levels

FACS considers that exposures that are below the action levels are indicative of well controlled hazards. Therefore, substance specific Cal/OSHA Action Levels (ALs) for beryllium, cadmium, and lead will serve as the basis of assessing the adequacy of hazard protection As no Cal/OSHA Action Levels exist for cobalt, copper, and mercury, an action level equal to 50% of the Cal/OSHA PELs of these metals will be used as METech's site specific action levels.

Site specific action levels, occupational exposure limits and NIOSH IDLHs for site contaminants are summarized in *Table 2* on the next page.

Table 2: Action Levels, Occupational Exposure Limits, TLV® Basis, and IDLH								
Contaminant	**Cal/OSHA PELs (mg/m³)**			**Cal/OSHA Regulation**	**ACGIH® TLVs® (mg/m³)**		**TLV ® Basis**	**NIOSH IDLH (mg/m3)**
	TWA	**STEL**	**AL**		**TWA**	**STEL**		
Beryllium	0.0002	0.002	0.0001	Title 8§5205	0.00005	----	Beryllium sensitization; berylliosis	4
Cadmium	0.005	----	0.0025	Title 8§5207	0.01	----	Kidney damage	9
Cobalt	0.20	----	0.10**	Title 8§5155	0.20	----	Asthma; pulmonary function; myocardial effects	20
Copper	1	----	0.05**	Title 8§5155	1	----	Irritation; gastro-intestinal effects	100
Lead	0.05	----	0.03	Title 8§5198	0.05	----	CNS & PNS impairment; hematologic effects	100
Mercury	0.025	0.1 (C)	0.013**	Title 8§5155	0.025	0.03	CNS & PNS impairment; kidney damage	10

mg/m³ = milligrams per cubic meter
Cal/OSHA PELs= Permissible Exposure Limits (PELs) mandated by the California Occupational Safety & Health Administration
ACGIH TLV® = Threshold Limit Values (TLVs) recommended by ACGIH (formerly the American Conference of Governmental Industrial Hygienists)H
NIOSH = National Institute for Occupational Safety and Health
TLV Basis – Source, 2018 TLVs® and BEIs®, Based on the Documentation of the Threshold Limit Values for Chemical Substances and Physical Agents published by ACGIH.
TWA = 8-hour Time-Weighted-Average
STEL = Short Term Exposure Limit (15 minute exposure, not to be exceeded at any time during work day) C= Ceiling (Concentration that should not be exceeded during any part of the working exposure)
AL = Action Level
IDLH = Immediately Dangerous to Life or Health Concentrations
** = non-regulatory action levels equal to 50% of the contaminants' PELs

3.4 Exposure Monitoring Program

The objective of this monitoring program is to perform exposure assessments to monitor the efficacy of engineering controls (i.e. local exhaust ventilation) and safe work practices used at METech to provide adequate health hazard protection for their employees. Due to the potential exposures to dusts contaminated with heavy metals, Cal/OSHA standards CCR Title 8 §5205 Beryllium, CCR Title 8 §5207 Cadmium, CCR Title 8 §5198 Lead, and CCR Title 8 §5155 Airborne Contaminants require the collection of initial personal air samples during typical workday operations and activities. To this end, a combination of personal and stationary area air monitoring of toxic dusts will be conducted at METech. Monitoring will be performed for the work full work shift and during select 15 minute increments for specific contaminants. Air sample results will be compared to site-specific action levels, full shift occupational exposure limits, and short term exposure limits. The personnel and locations subject to exposure monitoring, the frequency of exposure monitoring events, and changes to sampling frequency are presented detail in Section 3.5 and summarized in **Table 3.**

3.4.1 Personal Monitoring

Due to the potential exposure to dusts contaminated with heavy metals, Cal/OSHA standards CCR Title 8 §5205 Beryllium, CCR Title 8 §5207Cadmium, CCR Title 8 §5198 Lead, and CCR Title 8 §5155 Airborne Contaminants require the collection of initial personal air samples during typical work activities over the course of full shift 8-hour work day. Monitoring of all potentially exposed personnel is not required. A representative amount of personnel will be selected to wear air monitoring as follows:

- Shredder area – 50% of personnel
- Eddy current area – 50% of personnel
- Dismantling area – 1 person
- Warehouse – 1 person
- Maintenance shop – 1 person
- Former melting area – 1 person
- Forklift operator – 1 person

Fifteen-minute short term exposure limit sampling for beryllium and mercury will be performed a minimum four (4) times per work shift during exposure monitoring events. STEL monitoring will be performed at times when peak exposure to beryllium and mercury are expected to personnel working in the shredder and eddy current areas. The exact timing of STEL sampling events will

be a field decision made by the sampling technician based on operating conditions extant at the time of the survey.

3.4.2 Stationary Area Air Monitoring

Initially, stationary area monitoring will be conducted to supplement personal exposure monitoring. Stationary area air samples will be collected for the entirety of the work shift. No STEL stationary area air samples will be collected. Stationary area air samples will be collected in the following work areas:

- Dismantling area
- Maintenance shop
- Former melting area
- Warehouse area
- Inventory room

3.5 Monitoring Frequency

Personal and stationary area monitoring will be performed to document employee and area exposures to contaminants of concern. If engineering controls reduce exposures to the point that they are below site specific action levels and STELs, the frequency and scope (quantity of monitored personnel and monitored areas) will be reduced. Conditions that will result in exposure monitoring reductions are detailed in Sections 4.3.2 and 4.3.3. The exposure monitoring program and sampling frequency reductions are summarized in **Table 3.**

3.5.1 Phase 1 – Initial Exposure Monitoring (weekly for Four Weeks)

Initial industrial hygiene exposure monitoring will be conducted on a weekly frequency (one day per week) for a period of four weeks, commencing upon DTSC's approval of the Industrial Hygiene Exposure Monitoring Work Plan. Personnel and areas included in the initial exposure monitoring phase are stated in Sections 3.4.1 and 3.4.2.

3.5.2 Phase 2 – Reduction in Exposure Monitoring Frequency (Monthly for Three Months)

At the end of the initial exposure monitoring phase, a CIH will review the air samples results to determine if a reduction in exposure monitoring frequency is warranted. The frequency of

exposure monitoring will be reduced to a monthly frequency for a three month period when ***both*** of the following conditions are met:

i. **All** personal and stationary area air sampling results for all contaminants of concern are below the stipulated site-specific action levels *and*

ii. **All** personal mercury and beryllium air sample results are below their respective STELs.

Furthermore, if the above two conditions are met, area monitoring will be discontinued.

If the conditions for exposure monitoring frequency are not met as specified above exposure monitoring will continue to be performed on a weekly frequency, until the conditions stated in 3.5.2.i. and 3.5.2.ii are met for four consecutive weeks.

3.5.3 Phase 3 – Periodic Exposure Monitoring (Semi-annual)

Periodic exposure monitoring for workers in the shredder and eddy current areas will be reduced to a semi-annual frequency and personal monitoring in other work areas of the facility will be discontinued, if the monthly monitoring results show all personal monitoring results are below the site specific action levels and the mercury and beryllium STELs for three consecutive months. Semi-annual exposure monitoring will be permanent and limited to shredder and eddy current personnel, unless an exceedance above site specific action levels or the STELs occur.

3.5.4 Increase in Monitoring Frequency

If semi-annual exposure monitoring results show an exceedance above a site specific action level or STEL, exposure monitoring will be performed as soon as possible after corrective actions are implemented. The exposure monitoring will be limited to the worker(s) that incurred the exceedance and the specific contaminant that was exceeded. Confirmation of the adequacy of hazard controls will require the performance of two consecutive exposure assessments, conducted as soon as possible, but no later than thirty days, after corrective actions are implemented. After two consecutive measurements, taken within one month of the implementation of the corrective action, indicate that the exposure is well controlled (below site-specific action levels and/or STEL), personal exposure monitoring will revert back to a semi-annual frequency.

Table 3 – METech Exposure Monitoring Program Summary						
Contaminant of Concern	**Exposure Limits**		**Frequency & Duration**	**Personal Monitoring**		**Area Monitoring**
	AL	**STEL**		**Full Shift**	**STEL**	**Full Shift Only**
Beryllium	0.0001	0.0001	Frequency: Weekly; 1 day per week Duration: 4 weeks	Shredder area – 50% of personnel Eddy current area – 50% of personnel Dismantling area – 1 person Warehouse – 1 person Maintenance shop – 1 person Former melting area – 1 person Forklift operator – 1 person	Shredder area – 50% of personnel Eddy current area – 50% of personnel	Dismantling area Maintenance shop Former melting area Warehouse area Inventory room
Cadmium	0.0025	----				
Cobalt	0.01	----				
Copper	0.5	----				
Lead	0.03	----				
Mercury	0.05	0.03				
***Exposure monitoring frequency reduction conditions**:* 1. **All** personal and stationary area air sampling results for the contaminants of concern are below the stipulated site-specific action levels *and 2.* **All** personal mercury and beryllium air sample results are below their respective STELs.						
Beryllium	0.0001	0.0001	Frequency: Monthly; 1 day per month Duration: 3 months	Shredder area – 50% of personnel Eddy current area – 50% of personnel Dismantling area – 1 person Warehouse – 1 person Maintenance shop – 1 person Former melting area – 1 person Forklift operator – 1 person	Shredder area – 50% of personnel Eddy current area – 50% of personnel	None
Cadmium	0.0025	----				
Cobalt	0.01	----				
Copper	0.5	----				
Lead	0.03	----				
Mercury	0.05	0.03				
***Exposure monitoring frequency reduction conditions**:* 1. **All** personal and stationary area air sampling results for the contaminants of concern are below the stipulated site-specific action levels *and 2.* **All** personal mercury and beryllium air sample results are below their respective STELs.						
Beryllium	0.0001	0.0001	Frequency: Semi-annually; 1 day per 6 months. Duration: in perpetuity	Shredder area – 50% of personnel Eddy current area – 50% of personnel	Shredder area – 50% of personnel Eddy current area – 50% of personnel	None
Cadmium	0.0025	----				
Cobalt	0.01	----				
Copper	0.5	----				
Lead	0.03	----				
Mercury	0.05	0.03				
Notes: All exposure limits are in mg/m^3 Full Shift – minimum monitoring duration is 360 minutes STEL – monitoring duration is 15 minutes						

3.6 Exposure Monitoring Methods

Air samples will be collected by qualified field technicians working under the supervision of an ABIH (American Board of Industrial Hygienist) Certified Industrial Hygienist (CIH).

3.6.1 Beryllium, Cadmium, Cobalt, Copper, and Lead Monitoring

Exposure monitoring will be conducted for the full shift to measure airborne concentrations of beryllium, cadmium, cobalt, copper, and lead dust. Additionally, a minimum of four (4) STEL beryllium air samples will be collected during a work shift from workers in the shredder and eddy current areas. Representative personal and area air monitoring for beryllium, cadmium, cobalt, copper, and lead will be performed using personal battery-powered sampling pumps calibrated to a flow rate of approximately 2-3 liters per minute (lpm) with sample media consisting of 37-millimeter (mm) diameter, 0.8 µm (micron) pore-size, mixed cellulose ester (MCE) filters. Air sampling pumps will be calibrated, pre- and post- survey, using a field rotometer calibrated to a primary standard or by a primary standard such as a dry calibrator.

3.6.2 Mercury Monitoring

Monitoring will be conducted for mercury vapor for the full shift and select 15 minute durations using mercury vapor monitoring badges (Anasorb C300 or equivalent) and/or Carulite (Hydrar) solid sorbent tubes attached to portable air sampling pumps calibrated to operate at a flow rate range of 0.15 to 0.25 lpm. The air sampling pumps will be calibrated before and after the survey with field rotometers calibrated to a primary standard or with a field rotometer calibrated to a primary standard.

3.6.3 Laboratory Analysis

With each sample set, the field technician will submit a sufficient quantity of quality assurance field blanks along with a chain of custody form, to an independent, American Industrial Hygiene Association (AIHA) accredited laboratory for analysis. Samples shall be submitted for one (1) business day turnaround time, commencing upon receipt of the samples by the analytical laboratory.

3.6.3.1 Beryllium, Cadmium, Cobalt, Copper, and Lead Air Sample Analysis

Samples will be analyzed for beryllium, cadmium, cobalt, copper, and lead according NIOSH Analytical Method 7303, (inductively coupled argon plasma/atomic emission spectroscopy) or

equivalent methodology.

3.6.3.2 Mercury Air Sample Analysis

Samples will be analyzed for mercury according to NIOSH Analytical Method 6009 (atomic absorption, cold vapor) or equivalent.

3.7 Exposure Monitoring Conditions

During the industrial hygiene surveys, Field Technicians, working under the supervision of a CIH, will observe and document work site conditions and activities, including engineering controls, employee and facility work practices, wearing of personal protective equipment and other work place conditions that could affect exposures sustained by METech personnel. Photos of the work area and work activities will be taken for documentation purposes.

3.8 Data Review and Analysis

The CIH will review and analyze all exposure monitoring results and the field technician's observations. Analytical results will be compared to site-specific ALs, Cal/OSHA PELs, and ACGIH® TLVs®. The CIH will prepare and provide METech with summary tables of the exposure monitoring results along with laboratory analytical and chain of custody documents. Based on the analytical results and field technician's observations, the CIH will submit exposure control recommendations, as necessary to METech.

3.9 Employee Notification of Monitoring Results

METech will inform their personnel of the exposure monitoring results. Each employee will be notified in writing of the results which represent his/her exposure within 5 working days after receipt of the monitoring results and the summary table prepared by the CIH.

Whenever the results indicate that an employee exposure exceeds the site-specific action levels or short term exposure limit(s), notification shall be provided to the affected employee stating the specific occupational exposure limit (s) that was exceeded and providing a description of the corrective action taken to reduce exposure to a level below the site action level or STEL.

3.10 DTSC Notification of Monitoring Results

DTSC will be notified by METech in writing of exposure monitoring results within 5 working days after receipt of the monitoring results and the summary table prepared by the CIH.

3.11 Observation of Monitoring

Affected employees or their designated representatives will be provided with an opportunity to observe any monitoring of employee exposures. Any observers will be provided with the following:

- An explanation of the monitoring procedures.
- Opportunity to observe all steps related to the monitoring of airborne contaminants at the facility.
- Record the results obtained or receive copies of the results when received from the laboratory.

3.12 Exposure Recordkeeping

All personal and stationary exposure monitoring data pursuant to measuring exposures to beryllium, cadmium, cobalt, copper, and lead and mercury vapor will be maintained by METech for their employees' duration of employment plus 30 years in accordance with Cal/OSHA Title 8, CCR §3204, *Access to Employee Exposure and Medical Records*. Employee exposure monitoring data will include the following information: Name and social security number (last 4 digits) of each employee monitored; the employee's job title; the date of the monitoring event; the sample duration, and the exposure monitoring results.

4.0 SAFE WORK PRACTICES

The major concern with electronic waste is potential exposure to metal dusts and vapors, particularly during shredding of the waste. Inevitably, dust contaminated with beryllium, cadmium, copper, lead, and mercury will settle on surfaces. Contaminated dust on surfaces can be re-suspended or transferred by foot traffic to other locations. Employees who wear contaminated work clothing outside of the work place can transfer contaminated dust to their vehicles and homes. Therefore, work practices will be implemented that reduce the potential of dust re-suspension.

4.1 Housekeeping

All surfaces shall be maintained as free as practicable of dust accumulations. At the end of each work shift, daily cleaning of horizontal surfaces (equipment, floors, desks, etc.) throughout the facility will be performed. All surfaces should be cleaned using vacuums equipped with HEPA filters and/or damp methods.
Shoveling, brushing, dry dusting and dry sweeping is strictly prohibited. Usage of compressed air to clean surfaces is prohibited.

Sticky pads/mats are installed in front of doors to the office and lunch room areas to prevent dust from being tracked into non-production areas (offices and lunchroom).

To ensure that good housekeeping is maintained, each department is required to complete METech's *Housekeeping Inspection Checklist* on a daily frequency during Phase 1 air sampling. After the first four weeks, the housekeeping inspection will be conducted weekly.

Correction of unsatisfactory conditions noted on the checklist is the responsibility of the department's supervisor. *Housekeeping Inspection Checklist* records will be electronically archived and are subject to inspection by the DTSC. The *Housekeeping Inspection Checklist* is located in Appendix B.

4.2 Fans and Other Air Moving Equipment

Use of stationary fans, which can re-suspend dust, are strictly prohibited in the production areas. Use of compressed air to remove dust from clothing is prohibited.

4.3 Personal Hygiene

Eating, drinking, smoking, and applying make-up in production areas is strictly prohibited. Eating and drinking is restricted to the lunchroom. Bottled water is permitted in production areas.

Drinking water should be kept in a closed bottle.

Employees must remove protective clothing before entering the lunch room. To prevent ingestion of potentially hazardous dust, production employees are required to wash their hands before eating or drinking.

At the end of the work shift, production employees must shower to remove dust from the hair and body.

5.0 PERSONAL PROTECTIVE EQUIPMENT

Personal protective equipment (PPE) is the least effective means of controlling hazardous exposures and is not intended as the sole method for controlling hazardous exposures. Personal protective equipment will be worn by all production floor personnel as a means of supplementing engineering controls and safe work practices.

5.1 Coveralls, Hair Covering, Shoe Covers, and Gloves

Employees are not permitted to wear street clothes in production and maintenance areas. In production and maintenance areas, current employees are required to wear the following personal protective equipment:

- Full body work uniforms or a disposable coverall.
- Shoe covers
- Hair covering.
- Safety goggles and/or face shields.
- Reusable or disposable cut-resistant gloves
- Hard hats (Shredder and Eddy current personnel, only)
- Respiratory protection (Shredder and Eddy current personnel, only)

If work uniforms and reusable gloves are provided, they will be stored in a locker that is separate from street clothes. If lockers are not provided, work clothes and street clothes should be stored in separate plastic bags.

Wearing work clothes home is prohibited. Employees are required to shower and change into street clothes in order to prevent transfer of dust from the work place to their homes and vehicles.

5.2 Respiratory Protection

5.2.1 Shredder and Eddy Current Personnel

Until industrial hygiene exposure monitoring results verify that engineering controls are maintaining levels of metal dusts and mercury vapor are below site-specific action levels and STELs, personnel working in the shredder and eddy current areas are required to wear respiratory protection. NIOSH approved full-facepiece (assigned protection factor =50) or Half-mask (assigned protection factor =10) air purifying respirator with mercury vapor cartridges (with end-of-life indicator) with a HEPA (P-100) pre-filter will be required. Use of disposable dust masks (filtering face pieces) is not permitted.

METech personnel will be provided with personally issued and individually marked respirators. Respirators shall not be marked with any equipment that alters the fit of the respirator in any way.

All personnel required to wear respirators must be medically cleared, trained, and included in a respiratory protection program that meets the requirements of Cal/OSHA CCR Title 8 §5144 Respiratory Protection.

After personnel are medically cleared to wear respirators, METech shall ensure that the workers are initially qualitatively or quantitatively fit tested during a respiratory protection course of training set up and administered by a Certified Industrial Hygienist. All METech personnel who wear respiratory protection must have successfully passed a qualitative or quantitative fit-test within the past year for the brand, model and size respirator they plan to wear during the proposed activities. An individual shall use only those respirators for which he/she has been trained and fit tested.

Workers shall perform the positive and negative air pressure fit check each time a respirator is worn in accordance with the manufacturer's instructions or ANSI Z88.2.

All personnel wearing respirators must be clean shaven. No facial hair shall be permitted to be worn when wearing respiratory protection that requires a mask-to-face-seal.

Contact lenses shall not be worn in conjunction with respiratory protection equipment. If a worker wears glasses, a spectacle kit to fit their respirator will be provided by METech.

5.3 Change in Level of Respiratory Protection

The decision to downgrade or upgrade (respirators with higher assigned protraction factor) respiratory protection will be determined based on the review and analysis of exposure monitoring results by the CIH. The CIH will inform METech if exposure monitoring results merit an upgrade or downgrade (respiratory protection is no longer required) in respiratory protection for shredder and eddy current personnel.

5.4 Voluntary Respirator Usage

For those employees who are not required to wear respirators, but continue to do so, METech will provide the respirator users with the information contained in Appendix D ("*Information for Employees Using Respirators When Not Required Under the Standard*") of Cal/OSHA CCR Title 8 §5144 Respiratory Protection and implement those elements of a written respiratory protection program necessary to ensure that any employee using a respirator voluntarily is

medically able to use that respirator, and that the respirator is cleaned, stored, and maintained so that its use does not present a health hazard to the user. A written respiratory protection program will not be required for those employees whose only use of respirators involves the voluntary use of filtering facepieces (i.e. disposable dust masks).

5.5 PPE Training

All personnel required to wear personal protective equipment will receive training required by CCR Title 8, §5144, Respiratory Protection and §3380, Personal Protective Devices. METech will provide training to each employee who is required to wear PPE. Training topics will include:

- When PPE is necessary;
- What PPE is necessary;
- How to properly don, doff, adjust, and wear PPE;
- The limitations of the PPE; and,
- The proper care, maintenance, useful life and disposal of the PPE.

6.0 HAZARD COMMUNICATION

METech personnel that handle electronic waste are potentially exposed to hazards due to exposure to toxic dusts and vapors. These hazards can cause permanent and serious health problems that could begin without workers being aware of them. Handling and processing electronic waste potentially exposed personnel to beryllium, cadmium, cobalt, copper, lead, and mercury. Control measures such as local exhaust ventilation, implementation and use of personal protective equipment are the primary means of preventing employees from developing work related illness.

Education and training about occupational health hazards, regardless of control methodology, is imperative so that workers understand their health risks and the proper application and limitations of control methods. To this end, METech will provide training on the nature of chemical hazards at the facility in accordance of the following Cal/OSHA standards:

- CCR Title 8, §5194 Hazard Communication
- CCR Title 8, §5205 Beryllium
- CCR Title 8, §5208 Cadmium
- CCR Title 8, §5198 Lead

Employers are required to provide information to employees about the hazardous chemicals to which they are exposed. The Hazard Communication standard requires employers to obtain safety data sheets (SDSs) from chemical manufacturers, distributors and suppliers of chemicals utilized at the facility. The contaminants of concern at METech are not supplied, but are by-products of the recycling process. Therefore, in lieu of SDSs, included in Appendix A of this Industrial Hygiene Work Plan is information about the health effects of each of the contaminants of concern that are capable of being released during the handling and processing of electronic waste at METech. Training of personnel will be provided as follows:

- All employees will be provided with information and training on the contaminants which they encounter within the workplace.
- Training will be conducted:
    - At the time of their initial job assignment.
    - Whenever new hazards are introduced into the area.
    - As needed, to continually ensure employees understand the hazards of those contaminants in their work area.

Hazard Communication training will cover the following topics:

- Requirements of the Hazard Communication, Cadmium, Beryllium, and Lead Standards.
- Means to obtain information on the hazards of chemicals in their work area, including the use and understanding of the container labeling and the SDS systems (for chemical products supplied to METech).
- Operations in their work area where hazardous contaminants are present.
- Hazards associated with those contaminants in their work area.
- Hazards associated with chemicals in unlabeled containers.
- Means to detect the presence or release of contaminants in their work area.
- Means employees can take to protect themselves from contaminants in their work area.
- Location of the written Hazard Communication Program, chemical inventory and SDSs.

7.0 MEDICAL SURVEILLANCE

Medical screening examinations as part of a medical surveillance programs will be used as a tool to protect workers potentially exposed to hazardous substances. The medical surveillance program will be implemented as required by Cal/OSHA standards. In general, the medical surveillance program includes:

- Identifying personnel who need examination
- Establishing exam content
- Performing occupational medical examinations
- Documenting results of examinations
- Informing employees of the examination results
- Following up on abnormalities including medical removal , if required
- Counseling and education.

Initially, all production personnel will be selected for medical with respect to contaminants of concern identified at the site. Moving forward, selection of personnel for medical surveillance programs will be hazard based. In other words, including personnel selected in medical surveillance will be based primarily on industrial hygiene monitoring results and medical surveillance requirements stipulated by Cal/OSHA.

7.1 Medical Surveillance for the Use of Respiratory Protection

Respiratory protection may be required to prevent employee exposure to airborne contaminants. If respirator use is required, employees will need to undergo medical surveillance to receive clearance for respirator use. This surveillance shall be conducted in accordance with the METech's written respiratory protection program and the medical surveillance requirements of Cal/OSHA CCR Title 8, §5144, Respiratory Protection.

7.2 Beryllium Medical Surveillance

The medical surveillance provisions of Cal/OSHA, CCR Title 8 §5205 Beryllium standard apply to employees who meet the following conditions:

- All employees who are or will be exposed to inorganic arsenic above the action level (0.1 µg/m3), without regard to the use of respirators, for at least 30 days per year; and

- Employees who show signs or symptoms of CBD (chronic beryllium disease) that have been exposed above the action level, without regard to respirator use, for 30 days or more per year for a total of 10 years or more prior to August 1, 1978.
- Employees whore are exposed to beryllium during an emergency; or
- Employees whose most recent medical opinion recommends periodic medical surveillance.

The medical examination protocol (if necessary) will include at least the following elements:

- A medical and work history, with emphasis on past and present airborne exposure to or dermal contact with beryllium, smoking history, and any history of respiratory system dysfunction
- A physical examination with emphasis on the respiratory system;
- A physical examination for skin rashes;
- Pulmonary function tests, performed in accordance with the guidelines established by the American Thoracic Society including forced vital capacity (FVC) and forced expiratory volume in one second (FEV1);
- A standardized BeLPT or equivalent test, upon the first examination and at least every two years thereafter, unless the employee is confirmed positive. If the results of the BeLPT are other than normal, a follow-up BeLPT must be offered within 30 days, unless the employee has been confirmed positive. Samples must be analyzed in a laboratory certified under the College of American Pathologists/Clinical Laboratory Improvement Amendments (CLIA) guidelines to perform the BeLPT.
- A low dose computed tomography (LDCT) scan, when recommended by the physician after considering the employee's history of exposure to beryllium along with other risk factors, such as smoking history, family medical history, sex, age, and presence of existing lung disease; and
- Any other examinations which the physician believes appropriate.

Additional requirements for medical surveillance are found in CCR Title 8 §5205(k) Beryllium standard.

7.3 Cadmium Medical Surveillance

The medical surveillance provisions of Cal/OSHA, CCR Title 8 §5207 Cadmium standard apply to employees who meet the following conditions:

- Currently exposed - All employees who are or may be exposed to cadmium at or above the action level (2.5 µg/m3), without regard to the use of respirators, for at least 30 days per year (twelve consecutive months); and
- Previously exposed - Employees might previously have been exposed to cadmium at or above the action level by the employer, unless the employer demonstrates that the employee did not work for the employer in jobs with exposure to cadmium for an aggregated total of more than 60 months.

The medical examination protocol (if necessary) will include at least the following elements:

- A detailed medical and work history, with emphasis on: past, present, and anticipated future exposure to cadmium; any history of renal, cardiovascular, respiratory, hematopoietic, reproductive, and/or musculoskeletal system dysfunction; current usage of medication with potential nephrotoxic side-effects; and smoking history and current status; and
- Biological monitoring that includes the following tests:
- Cadmium in urine (CdU), standardized to grams of creatinine (g/Cr);
- Beta-2 microglobulin in urine (β2 -M), standardized to grams of creatinine (g/Cr), with pH specified, as described in Appendix F of CCR Title 8 §5207; and
- Cadmium in blood (CdB), standardized to liters of whole blood (lwb).

Additional requirements for medical surveillance are found in CCR Title 8 §5207(l) Cadmium standard.

7.4 Lead Medical Surveillance

The medical surveillance provisions of Cal/OSHA, CCR Title 8 §5198.Lead standard apply to employees who meet the following conditions:

- All employees who are or may be exposed to lead at or above the action level (30 µg/m3), without regard to the use of respirators, for at least 30 days per year.

The medical examination protocol (if necessary) will include at least the following elements:

- Biological monitoring that includes the following tests:
- Blood Lead and Zinc Protoporphrin (ZPP) sampling and analysis.
- At least every 6 months
- At least every two months for each employee whose last blood sampling and analysis indicated a blood lead level at or above 40 µg/100 g of whole blood. This frequency shall

continue until two consecutive blood samples and analysis indicate a blood lead level below 40 µg/100 g of whole blood; and

- At least monthly during the removal period of each employee removed from exposure to lead due to an elevated blood lead level.
- ZPP determinations shall be made available as soon as possible but no later than the first biological monitoring scheduled for an employee.

Additional requirements for medical surveillance are found in CCR Title 8 §5198(j) Lead standard.

8.0 BAG HOUSE DUST SAMPLING AND ANALYSIS

During typical operations, approximately 10 to 15 kg of dust is collected. Bag house dust is collected in impermeable super sacks. In order to determine the disposition of the collected sampling will be conducted. METech will dust samples from the bag house at the end of each phase stated in Section 3.5 of this document.

Sampling of bag house dust will be collected in accordance with EPA SW-846. The sampling procedure will be as follows:

- A minimum of three samples will be collected from each super sack using a scoop.
- The samples will be placed in a laboratory supplied container and submitted to a State-certified lab under chain-of-custody.
- The laboratory will combine the samples to create a single composite.

Dust samples will be submitted to an ELAP certified laboratory for analysis. The composite sample will be analyzed for CAM 17 metals. Based on the TTLC results, STLC and or TCLP analysis will be conducted. The bag house dust will be managed for disposal or recycling based on the characterization results and in accordance with applicable requirements.

Sample analytical results will be submitted to DTSC within five (5) days upon receipt of the results from the analytical laboratory.

Appendix A
Contaminants of Concern – Health Effects

Beryllium

The most common health effects associated with overexposure to beryllium in the workplace include: beryllium sensitization, chronic beryllium disease (CBD), and lung cancer.

Beryllium Sensitization - Beryllium sensitization is the activation of the body's immune response to beryllium. Beryllium sensitization can result from inhalation or skin exposure to beryllium dust, fume, mist, or solutions. While no clinical symptoms are associated with sensitization, a sensitized worker is at risk of developing CBD when inhalation exposure to beryllium has occurred.

Chronic Beryllium Disease - CBD is a chronic granulomatous lung disease caused by inhaling airborne beryllium after becoming sensitized to beryllium. The common symptoms of CBD are shortness of breath, unexplained coughing, fatigue, weight loss, fever, and night sweats. CBD can result from inhalation exposure to beryllium at levels below the current OSHA PEL (0.2 $\mu g/m^3$). Progression of CBD can vary among individuals. For instance, after initial exposure to beryllium, some workers may quickly develop signs and severe symptoms of CBD. Others may not experience signs and symptoms until months or years after initial exposure. The symptoms can sometimes worsen even after the worker has been removed from exposure. CBD can progress to a chronic obstructive lung disorder, resulting in loss of quality of life and the potential for decreased life expectancy.

CBD shares many signs and symptoms with pulmonary sarcoidosis, a granulomatous lung disease of unknown cause or origin. Without appropriate diagnosis, CBD may be difficult to distinguish from sarcoidosis.

Lung cancer - Based on numerous studies in occupational settings, OSHA has determined that occupational exposure to beryllium causes lung cancer in humans. In addition, the International Agency for Research on Cancer (IARC) classifies beryllium as a Group 1 carcinogen (carcinogenic to humans), and the National Toxicology Program (NTP) lists beryllium as a known human carcinogen.

Acute Beryllium Disease (ABD) - Acute beryllium disease (ABD) is a rapid onset form of chemical pneumonia that results from breathing high airborne concentrations of beryllium. ABD is generally associated with exposure to beryllium levels at or above 100 $\mu g/m^3$ and may be fatal in 10 percent of cases. ABD is extremely rare in the workplace today due to more stringent exposure controls implemented following occupational and environmental standards set in the 1970s.

Cadmium

Acute Health Effects

The following acute (short-term) health effects may occur immediately or shortly after exposure to Cadmium:

- Contact can irritate the skin and eyes.
- Exposure to Cadmium may cause "metal fume fever." This is a flu-like illness with symptoms of metallic taste in the mouth, headache, fever and chills, aches, chest tightness and cough. The symptoms may be delayed for several hours after exposure and usually last for a day or two.
- Cadmium can cause nausea, vomiting, diarrhea and abdominal pain.
- Inhaling Cadmium can irritate the lungs causing coughing and/or shortness of breath. Higher exposures may cause a build-up of fluid in the lungs (pulmonary edema), a medical emergency, with severe shortness of breath.

Chronic Health Effects

The following chronic (long-term) health effects can occur at some time after exposure to Cadmium and can last for months or years:

Cancer Hazard

- Cadmium is a SUSPECT CARCINOGEN in humans. It has been shown to cause lung and prostate cancer.

Reproductive Hazard

- Cadmium is a PROBABLE TERATOGEN in humans.
- Cadmium may damage the male reproductive system (testes) and affect the female reproductive cycle.

Other Effects

- Cadmium can irritate the lungs. Repeated exposure may cause bronchitis to develop with coughing, phlegm, and/or shortness of breath.
- Repeated low exposures can cause liver and kidney damage.
- Cadmium can cause anemia, loss of sense of smell (anosmia) and/or discoloration of teeth.

Cobalt

Acute Health Effects

The following acute (short-term) health effects may occur immediately or shortly after exposure to Cobalt:

- Exposure to Cobalt dust can irritate the skin, eyes, nose and throat.

Chronic Health Effects

The following chronic (long-term) health effects can occur at some time after exposure to Cobalt and can last for months or years:

Cancer Hazard

- Cobalt may be a CARCINOGEN in humans since it has been shown to cause cancer of the muscle (only at the injection site) in animals.

Reproductive Hazard

- Cobalt may damage the male reproductive system (including a decrease in sperm count) and affect male fertility in animals.

Other Long-Term Effects

- Cobalt may cause a skin allergy. If allergy develops, very low future exposure can cause itching and a skin rash.
- Cobalt may cause an asthma-like allergy. Future exposure can cause asthma attacks with shortness of breath, wheezing, cough, and/or chest tightness.
- Cobalt may affect the heart, thyroid, liver and kidneys.
- Repeated exposure to Cobalt dust can cause scarring of the lungs (fibrosis) even if no symptoms are noticed. This can be disabling or fatal.

Copper

Acute Health Effects

The following acute (short-term) health effects may occur immediately or shortly after exposure to Copper:

- Contact can irritate and burn the skin and eyes.
- Inhaling Copper can irritate the nose and throat, causing coughing and wheezing.
- Copper can cause headache, nausea, vomiting, diarrhea and abdominal pain.
- Exposure to Copper can cause "metal fume fever." This is a flu-like illness with symptoms of metallic taste in the mouth, headache, fever and chills, aches, chest tightness and cough. The symptoms may be delayed for several hours after exposure and usually last for a day or two.

Chronic Health Effects

The following chronic (long-term) health effects can occur at some time after exposure to Copper and can last for months or years:

Reproductive Hazard

- Copper may decrease fertility in males and females.

Other Effects

- Inhaling Copper can cause a sore and/or a hole in the "bone" (septum) dividing the inner nose, sometimes with bleeding, discharge, and/or formation of a crust.
- Repeated exposure may cause a greenish discoloration of the skin, hair and teeth.
- Copper may cause a skin allergy. If allergy develops, very low future exposure can cause itching and a skin rash.
- Copper may affect the liver and kidneys.

Lead

Acute Health Effects

Lead poisoning can happen if a person is exposed to very high levels of lead over a short period of time. When this happens, a person may feel:

- Abdominal pain
- Constipated
- Tired
- Headachy
- Irritable
- Loss of appetite
- Memory loss
- Pain or tingling in the hands and/or feet

Because these symptoms may occur slowly or may be caused by other things, lead poisoning can be easily overlooked. Exposure to high levels of lead may cause anemia, weakness, and kidney and brain damage. Very high lead exposure can cause death.

Lead can cross the placental barrier, which means pregnant women who are exposed to lead also expose their unborn child. Lead can damage a developing baby's nervous system. Even low-level lead exposures in developing babies have been found to affect behavior and intelligence. Lead exposure can cause miscarriage, stillbirths, and infertility (in both men and women).

Generally, lead affects children more than it does adults. Children tend to show signs of severe lead toxicity at lower levels than adults. Lead poisoning has occurred in children whose parent(s) accidentally brought home lead dust on their clothing. Neurological effects and mental retardation have also occurred in children whose parent(s) may have job-related lead exposure.

Chronic Health Effects

A person who is exposed to lead over time may feel:

- Abdominal pain
- Constipated
- Depressed
- Distracted
- Forgetful
- Irritable
- Nauseous/Sick

People with prolonged exposure to lead may also be at risk for high blood pressure, heart disease, kidney disease, and reduced fertility.

The Department of Health and Human Services (DHHS), Environmental Protection Agency (EPA), and the International Agency for Research on Cancer (IARC) have determined that lead is probably cancer-causing in humans.

Mercury

Acute Health Effects

The following acute (short-term) health effects may occur immediately or shortly after exposure to mercury:

- Contact can irritate the skin and eyes.
- Inhaling Mercury can irritate the nose, throat and lungs causing coughing, wheezing and/or shortness of breath.
- Exposure can cause metallic taste in the mouth, nausea and vomiting, and abdominal pain.

Chronic Health Effects

The following chronic (long-term) health effects can occur at some time after exposure to Mercury and can last for months or years:

Reproductive Hazard

- There is limited evidence that mercury may cause an increase in spontaneous abortions and menstrual disorders in exposed women.
- There is limited evidence that mercury may affect male fertility.
- Mercury may also damage the developing fetus in animals.

Other Effects

- Mercury can irritate the lungs. Repeated exposure may cause bronchitis to develop with coughing, phlegm, and/or shortness of breath.
- Mercury may cause a skin allergy. If allergy develops, very low future exposure can cause itching and a skin rash.
- Long-term contact can cause the skin to turn gray, brown staining in the eyes, and may affect peripheral vision (ability to see to the sides).
- Repeated exposure or a very high single exposure can cause Mercury poisoning. Symptoms include tremors (shaking), trouble remembering and concentrating, gum problems, increased salivation, loss of appetite and weight, and changes in mood and personality. These can be severe and cause hallucinating and psychosis.
- Mercury may damage the kidneys.

Appendix B
Housekeeping Inspection Checklist

METech Housekeeping Inspection Checklist

Department Inspected: _____

Inspector: _____

Date: _____

Department Supervisor: _____

*This checklist should be completed on a **weekly frequency***. Should a "No" be recorded for any of the below checklist items, immediate follow-up action is by the head of the inspected department to correct the observed deficiency. The checklist will be provided to the department head that will be responsible for implementation of corrective action(s).

	Condition	Condition is Satisfactory?	Remarks	Corrective Action	Corrective Action Date
1	Work area is clean, tidy and clutter-free.	o Yes o No			
2	There are no unnecessary items in the work area.	o Yes o No			
3	There are no food and drinks in the work area.	o Yes o No			
4	Aisles, walkways, stairways and exits are unobstructed.	o Yes o No			
5	There are no objects protruding into aisles and walkways.	o Yes o No			
6	Access to emergency equipment (e.g., fire extinguishers, first aid kits) is unobstructed.	o Yes o No			
7	Work stations and other horizontal surfaces are free of visible dust accumulations.	o Yes o No			
8	Equipment surfaces are free of visible dust accumulations.	o Yes o No			
9	Floors are free from visible dust accumulations.	o Yes o No			
10	Floors (e.g., tiles, boards and carpets) are in good condition.	o Yes o No			

11	Floor markings are highly visible and not faded.	o Yes o No			
12	Floor openings or holes are guarded by a cover, grating or guardrail on all sides (except at entrances to stairways or ladders).	o Yes o No			
13	Sticky mats/pads are in good condition and changed out when dirty.	o Yes o No			
14	HEPA vacuums are in good working order.	o Yes o No			
15	Light sources are clean and provide adequate illumination for working.	o Yes o No			
16	Warning signs are in good condition and can be clearly seen from afar.	o Yes o No			
17	Cords, cables and hoses are bundled up when not in use.	o Yes o No			
18	Machine and equipment guards are in place and secure.	o Yes o No			
19	Tools are in good condition and in their designated location.	o Yes o No			
20	Physical barriers and warnings signs are installed around workplace hazards (e.g., sharp objects, protruding objects, a hot surface, a floor opening).	o Yes o No			
21	Storage areas are clean, tidy and organized.	o Yes o No			
22	Stacked materials are placed on a flat and firm foundation.	o Yes o No			
23	Storage racks used are adequate for the task and in good condition.	o Yes o No			
24	Heavier and bulkier items are placed on the lower shelves of storage racks.	o Yes o No			
25	Hazardous substances (e.g., flammable materials, toxic substances) are stored in separate compatible containers.	o Yes o No			
26	Hazardous products are stored away from heat sources.	o Yes o No			

27	Proper waste bins for general waste, and recyclable waste are provided in work areas to facilitate proper disposal.	o Yes o No			
28	Storage areas and products are organized to keep incompatible products separated.	o Yes o No			
29	Waste containers and drums are properly organized and labeled.	o Yes o No			
30	Waste storage areas are free of visible dust accumulations.	o Yes o No			
31	Combustible waste is properly disposed of. For example, oily rags are disposed in closed metal .waste bins.	o Yes o No			
32	Spill cleanup materials and equipment are available?	o Yes o No			
33	Waste (including hazardous waste) is collected regularly so that there is no unnecessary accumulation of waste.	o Yes o No			
34	Waste containers are free of leaks or damage.	o Yes o No			
35	Waste containers are properly labeled?	o Yes o No			
36	Shredder system components are free of visible dust accumulations.	o Yes o No			
37	Eddy current components are free of visible dust accumulations.	o Yes o No			

Right People

Right Perspective

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