

# Lead Awareness Training

## MTS Systems Corporation

Hickey Consultants

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# Overview

- Lead and its properties
- Health effects of lead
- OSHA acceptable lead exposure levels
- Housekeeping and work practices
- Lead testing at MTS

# What is Lead?



- Heavy metal at room temperature
- Bluish-gray
- Low melting point (621 degrees f.)
- Pliable
- Corrosion resistant
- Can form lead compounds

# Where do you find lead?

- Storage batteries



- Pigment for paints, dyes and ceramic glazes



# Where do you find lead?

Fishing sinkers

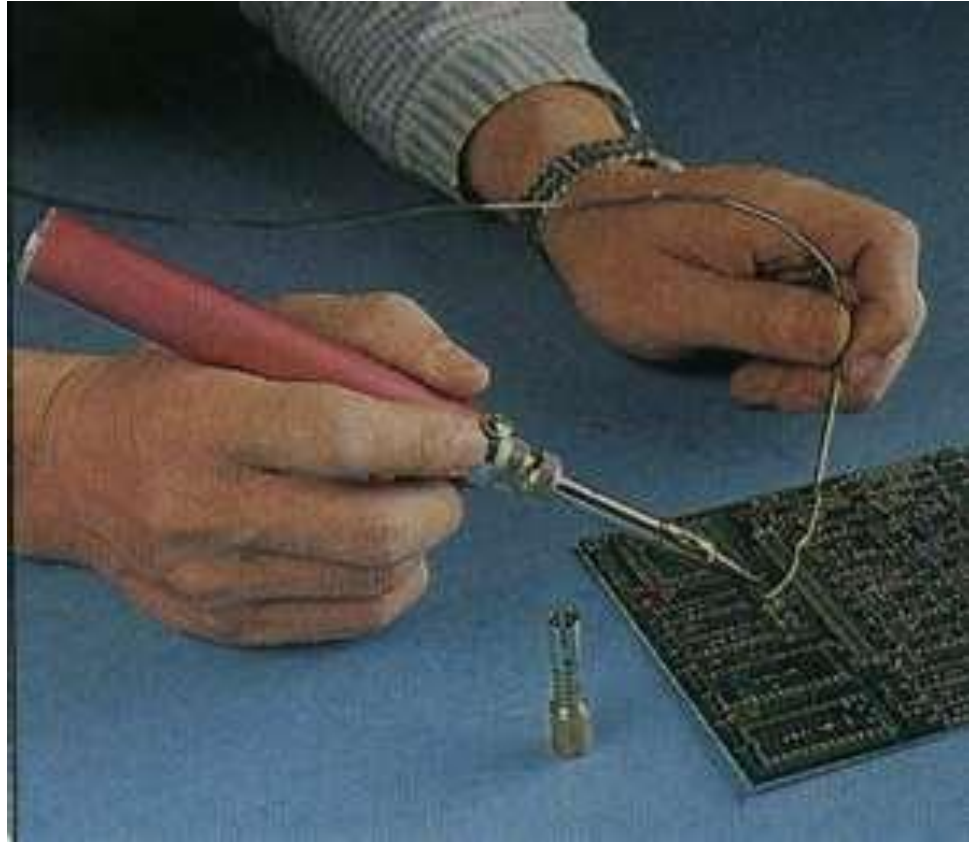


- Ammunition

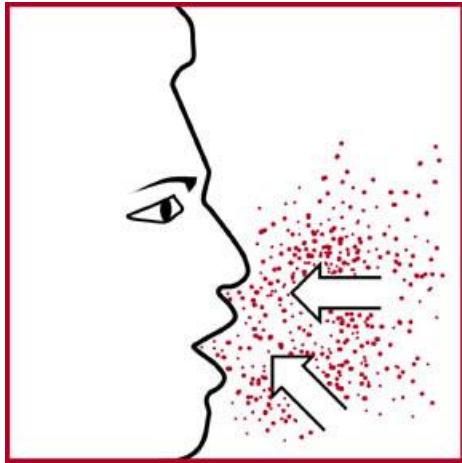


# Where do you find lead?

- Solder



# Ways in which lead enters the body



- Inhalation - Breathing lead fumes or dust.
- Ingestion - Swallowing lead dust via food or cigarettes, through hand to mouth contact.

# Lead Exposure Health Effects

- Lead which is inhaled or ingested enters the bloodstream.
- Can be circulated throughout your body.
- Some is excreted while some remains in organs and body tissues.
- If exposure continues, the amount stored in your body will increase if you are absorbing more lead than your body is excreting.
- Lead is usually not absorbed through the skin.
  - However it can enter through cuts on the hands.



# Acute Health Effects

- Reported acute (short term) health effects include: loss of appetite, nausea, vomiting, stomach cramps, constipation, difficulty in sleeping, fatigue, moodiness, headache, joint or muscle aches, anemia, and decreased sexual drive
- In rare cases brain damage, coma and death have occurred.

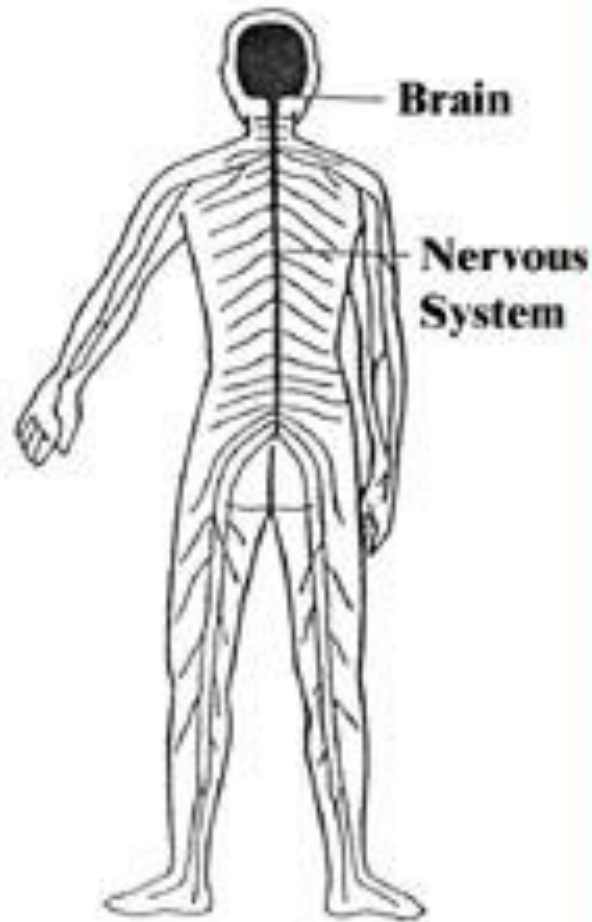
# Chronic Exposure Effects

- During prolonged chronic exposure, many body systems can be affected by lead, including
- Blood system – impairs production of “heme”, which carries oxygen to body tissues
- Nervous system – damages the central nervous system and brain tissue
- Urinary system – damages the kidneys
- Reproductive system – sterility, decreased sex drive, impotence, miscarriages, menstrual disturbances, and lead can cross the placenta into the fetus in women

# Health Effects

## Nervous System and Brain

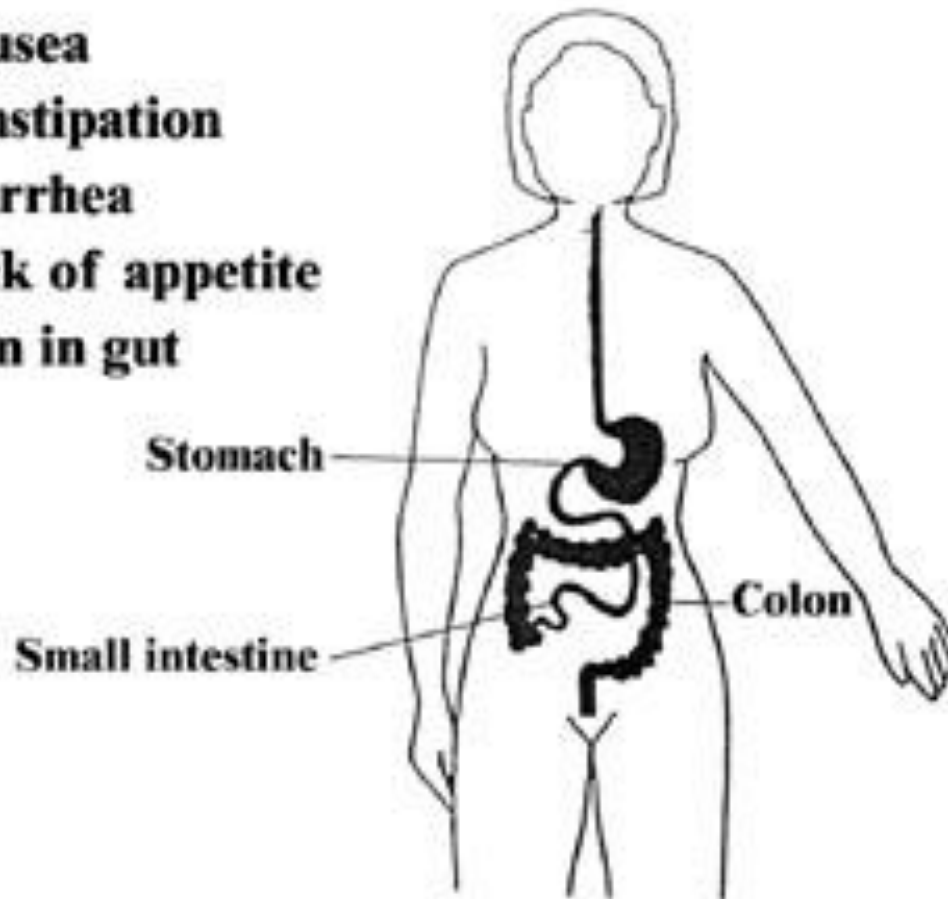
- **Headaches**
- **Tired all the time**
- **Irritability**
- **Moodiness**
- **Poor concentration**
- **Memory loss**
- **Shakiness**
- **Weakness in arms and legs**



# Health Effects

## **Digestive System**

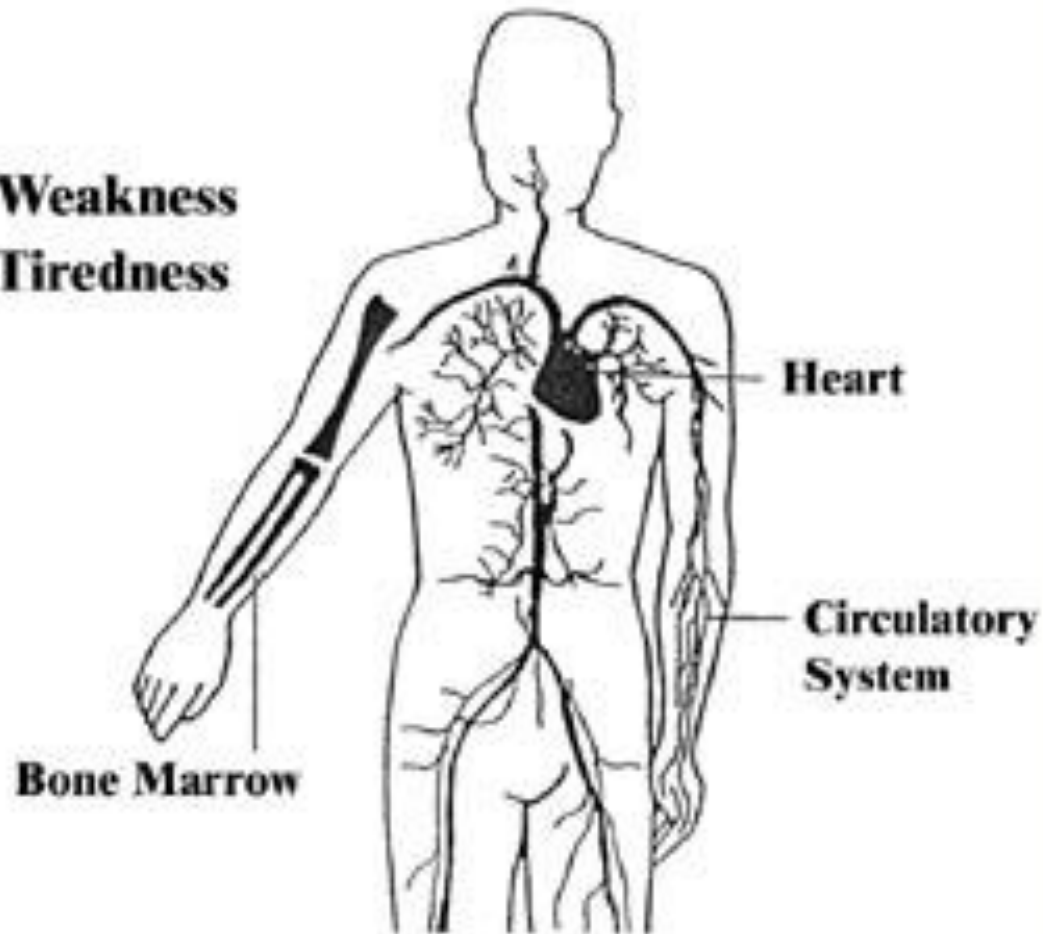
- **Nausea**
- **Constipation**
- **Diarrhea**
- **Lack of appetite**
- **Pain in gut**



# Health Effects

## Blood-Forming System

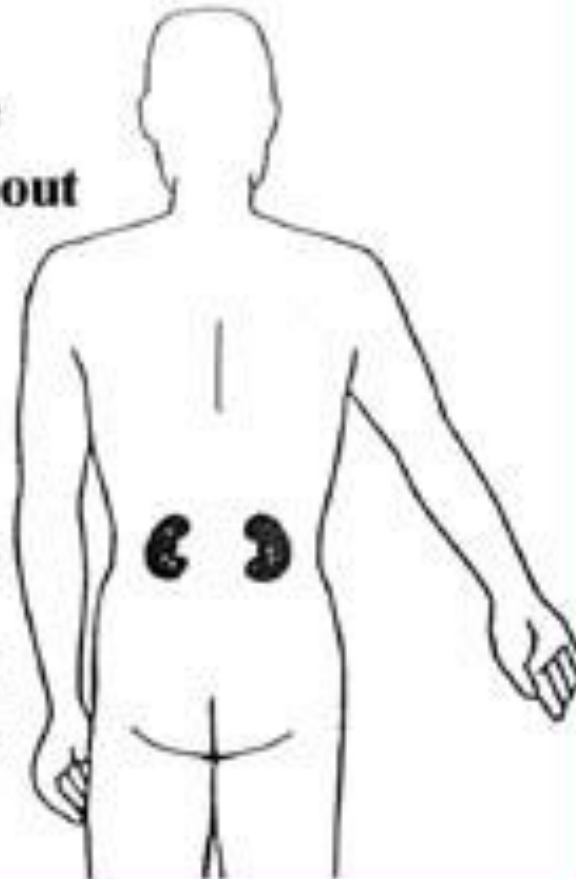
- **Weakness**
- **Tiredness**



# Health Effects

## **Kidneys/Reproductive System**

- **High blood pressure**
- **Damage occurs without knowing it**
- **Kidney failure can cause death**
- **Men – Impotence, decreased sex drive, sterility**
- **Women – decreased sex drive, infertility**



# OSHA Permissible Exposure Limits

- The permissible exposure limit (PEL) for an 8 hour time weighted average (TWA) exposure to airborne lead is 50 micrograms per cubic meter ( $\mu\text{g}/\text{m}^3$ ) of air.
- This is the concentration that an average worker can be exposed to for a working lifetime without adverse health effects in most of the population.

# The All-Important Action Level

- If lead is present in any quantity in your workplace, OSHA has directed that an “initial determination” must be made by taking air samples while workers are performing their job that may result in airborne lead exposure.
- The OSHA Action Level for lead is  $30 \mu\text{g}/\text{m}^3$ .
- AL initiates several requirements for the standard such as exposure monitoring, medical surveillance and training and education.
- If the air sample results are below the Action Level after 2 sessions of testing, no further monitoring is necessary for that job, and the workers are not considered to be significantly exposed to lead.



# Housekeeping/Work Practices

- Use exhaust ventilation to capture dust/fumes whenever possible;
- HEPA vacuum dust covered work surfaces; **dry sweeping or compressed air is prohibited**; wet wiping methods may be used;
- Do not eat, drink, smoke or apply cosmetics in areas where lead is present;
- Wash hands and face after lead soldering work and prior to eating.

# Awareness of Lead Standard

- OSHA Regulations state:  
Where there is a potential exposure to airborne lead at any level, the employee must be informed of the contents of OSHA 29 CFR 1910.1025, Appendix A & B.
- Because you may be exposed to lead, even in small quantities, the next three slides describe the contents of Appendix A & B

# Appendix A

- Substance Identification
- Health Hazard Data

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Regulations (Standards - 29 CFR) - Table of Contents

• <b>Part Number:</b>	1910
• <b>Part Title:</b>	Occupational Safety and Health Standards
• <b>Subpart:</b>	Z
• <b>Subpart Title:</b>	Toxic and Hazardous Substances
• <b>Standard Number:</b>	1910.1025 App A
• <b>Title:</b>	Substance data sheet for occupational exposure to lead

I. SUBSTANCE IDENTIFICATION

A. Substance: Pure lead (Pb) is a heavy metal at room temperature and pressure and is a basic chemical element. It can combine with various other substances to form numerous lead compounds.

B. Compounds Covered by the Standard: The word "lead" when used in this standard means elemental lead, all inorganic lead compounds and a class of organic lead compounds called lead soaps. This standard does not apply to other organic lead compounds.

C. Uses: Exposure to lead occurs in at least 120 different occupations, including primary and secondary lead smelting, lead storage battery manufacturing, lead pigment manufacturing and use, solder manufacturing and use, shipbuilding and ship repairing, auto manufacturing, and printing.

D. Permissible Exposure: The Permissible Exposure Limit (PEL) set by the standard is 50 micrograms of lead per cubic meter of air (50 ug/m(3)), averaged over an 8-hour workday.

E. Action Level: The standard establishes an action level of 30 micrograms per cubic meter of air (30 ug/m(3)), time weighted average, based on an 8-hour work-day. The action level initiates several requirements of the standard, such as exposure monitoring, medical surveillance, and training and education.

# Appendix B

- Permissible Exposure Limit (PEL)
- Exposure Monitoring
- Methods of Compliance
- Respiratory Protection
- Personal Protective Equipment
- Housekeeping
- Hygiene Facilities

# Appendix B

- Medical Surveillance
- Medical Removal
- Training and Information
- Signs
- Record keeping

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• Part Number:	1910
• Part Title:	Occupational Safety and Health Standards
• Subpart:	Z
• Subpart Title:	Toxic and Hazardous Substances
• Standard Number:	1910.1025 App B
• Title:	Employee standard summary

This appendix summarizes key provisions of the standard that you as a worker should become familiar with.

I. PERMISSIBLE EXPOSURE LIMIT (PEL) - PARAGRAPH (C)

The standards sets a permissible exposure limit (PEL) of fifty micrograms of lead per cubic meter of air (50 ug/m(3)), averaged over an 8-hour work-day. This is the highest level of lead in air to which you may be permissibly exposed over an 8-hour workday. Since it is an 8-hour average it permits short exposures above the PEL so long as for each 8-hour work day your average exposure does not exceed the PEL.

This standard recognizes that your daily exposure to lead can extend beyond a typical 8-hour workday as the result of overtime or other alterations in your work schedule. To deal with this, the standard contains a formula which reduces your permissible exposure when you are exposed more than 8 hours. For example, if you are exposed to lead for 10 hours a day, the maximum permitted average exposure would be 40 ug/m(3).

II. EXPOSURE MONITORING - PARAGRAPH (D)

If lead is present in the workplace where you work in any quantity, your employer is required to make an initial determination of whether the action level is exceeded for any employee. This initial determination must include instrument monitoring of the air for the presence of lead and must cover the exposure of a representative number of employees who are reasonably believed to have the highest exposure levels. If

# 2015 Lead Air Monitoring Results at MTS

Air Sampling Results in solder area, MTS, Eden Prairie, Minnesota, January 20, 2015.

Sample No.	Location	Sample volume liters	Description	Lead Results ug/m3
MT-01	Transducer Manufacturing	575	Soldering	<7
MT-02	Transducer Manufacturing	574	Soldering	<7
MT-03	GRPF	530	Soldering	<7.5
MT-04	Open field blank	0		<4ug/filter
	<b>OSHA Action Level</b>			<b>30</b>
	<b>OSHA PEL</b>			<b>50</b>

# 2015 Post Cleaning Lead Wipe Sampling Results at MTS after 3:30 pm.

3.2 Wipe Sampling Results 1 ft<sup>2</sup> in solder area, MTS, Eden Prairie, Minnesota, February 12, 2015.

Sample No.	Location	Map Location Number	Description	Lead Results ug/ft <sup>2</sup>
Pb-30	ERPF SW O-16	6	Table	200
Pb-31	ERPF SW O-16	6	Floor	200
Pb-40	Electronic Assembly N-6	14	Table	72
Pb-41	Electronic Assembly N-6	14	Floor	160
Pb-42	Transducer L-5	13	Table	54
Pb-43	Transducer L-5	13	Floor	110
			EPA limits for floors	40
			EPA limits for indoor window sills	250
			EPA limits for window troughs	400

ug/ft<sup>2</sup> = micrograms of material per square foot of surface area

EPA = Environmental Protection Agency. These limits are to be used as a guide for the MTS office building. The EPA limits are designed for buildings containing children.

# Lead Wipe Results, Post Cleaning

Sample No.	Location	Map Location Number	Description	Lead Results ug/ft <sup>2</sup>
Pb-23			Open field blank	<10 ug/wipe
Pb-24	Checkout I-14	1	Floor	20
Pb-25	L-14	8	Desk	18
Pb-26	L-14	8	Harlen Anderson, Floor	<10
Pb-27	Landmark M-13	9	Table	<10
Pb-28	Landmark M-13	9	Floor	20
Pb-29	Actuator Assembly N-14	2	Floor	<10
<b>Pb-30</b>	<b>ERPF SW O-16</b>	<b>6</b>	<b>Table</b>	<b>200</b>
<b>Pb-31</b>	<b>ERPF SW O-16</b>	<b>6</b>	<b>Floor</b>	<b>200</b>
Pb-32	Electronic Assembly Break Room O-10		Top of Microwave. Surface was very clean, no dust.	<10
Pb-33	Electronic Assembly Break Room O-10		Lunch room Table where workers eat. (Lead levels most likely from lead on skin or clothing in contact with the surface.)	13
Pb-34	Electronic Assembly Break Room O-10		Floor	<10
			<b>EPA limits for floors</b>	<b>40</b>
			<b>EPA limits for indoor window sills</b>	<b>250</b>
			<b>EPA limits for window troughs</b>	<b>400</b>



# Lead Wipe Results, Post Cleaning

3.2 Wipe Sampling Results 1 ft<sup>2</sup> in solder area, MTS, Eden Prairie, Minnesota, February 12, 2015.

Sample No.	Location	Map Location Number	Description	Lead Results ug/ft <sup>2</sup>
Pb-35			Open field blank	<10
Pb-36	Electronic Assembly N-6	14	Mary Lou Oaks, Table	<10
Pb-37	Electronic Assembly N-6	14	Mary Lou Oaks, Floor	<10
Pb-38	Electronic Assembly N-6	14	Pam Su Swedeen, Table	12
Pb-39	Electronic Assembly N-6	14	Pam Su Swedeen, Floor	11
<b>Pb-40</b>	<b>Electronic Assembly N-6</b>	<b>14</b>	<b>Mary Jo Kerber, Table</b>	<b>72</b>
<b>Pb-41</b>	<b>Electronic Assembly N-6</b>	<b>14</b>	<b>Mary Jo Kerber, Floor</b>	<b>160</b>
<b>Pb-42</b>	<b>Transducer L-5</b>	<b>13</b>	<b>Steve Nevela, Table</b>	<b>54</b>
<b>Pb-43</b>	<b>Transducer L-5</b>	<b>13</b>	<b>Steve Nevela, Floor</b>	<b>110</b>
			<b>EPA limits for floors</b>	<b>40</b>
			<b>EPA limits for indoor window sills</b>	<b>250</b>
			<b>EPA limits for window troughs</b>	<b>400</b>

ug/ft<sup>2</sup> = micrograms of material per square foot of surface area

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# Lead Wipe Sample on Dest, 200 $\mu\text{g}/\text{ft}^2$



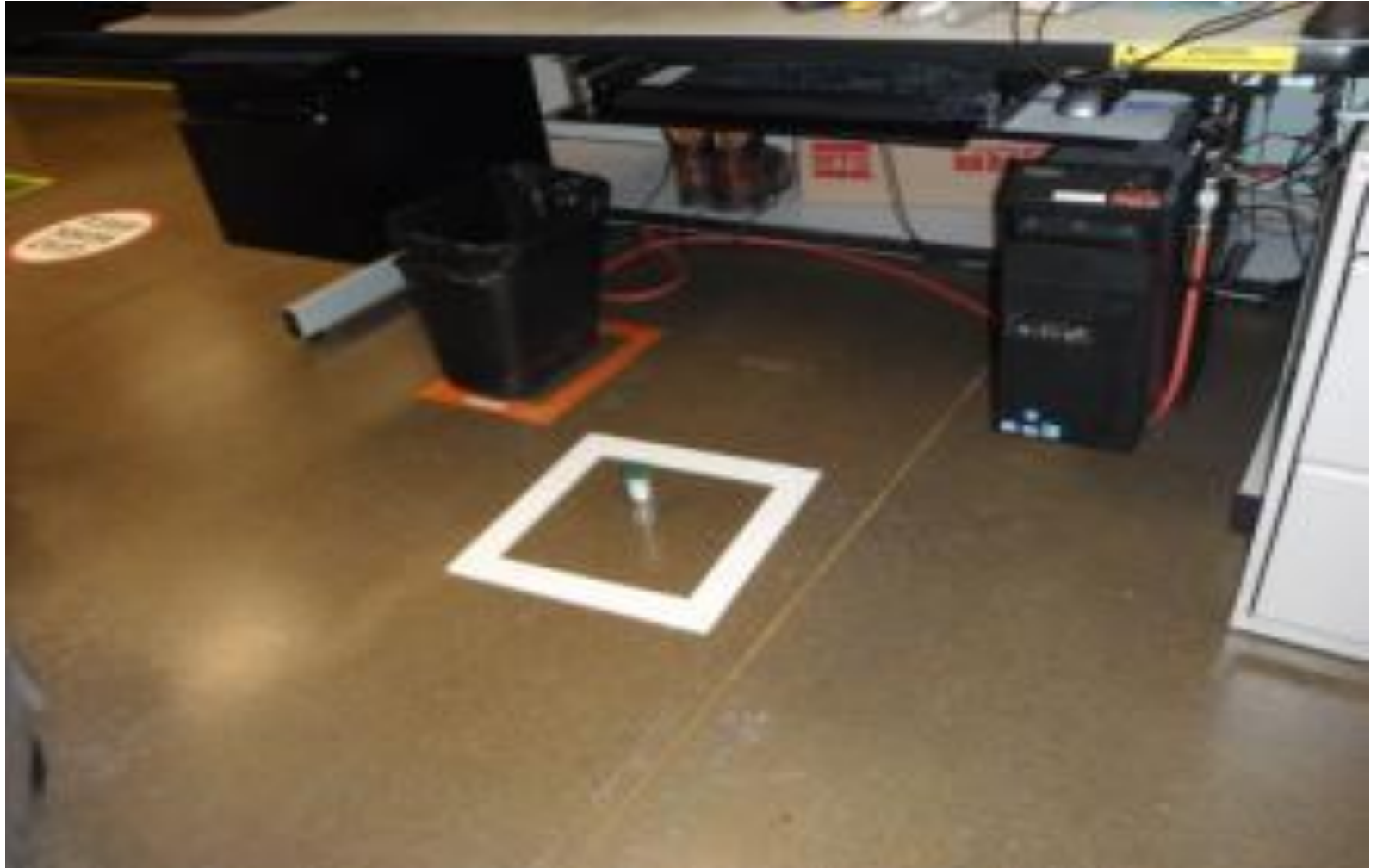
# Lead Wipe Sample on Floor, 220 $\mu\text{g}/\text{ft}^2$



# Lead Wipe Sample on Desk, 72 $\mu\text{g}/\text{ft}^2$



# Lead Wipe Sample on Floor, 160 $\mu\text{g}/\text{ft}^2$



Lead Wipe Sample on Desk,  
54  $\mu\text{g}/\text{ft}^2$



# Lead Wipe Sample on Floor, 110 $\mu\text{g}/\text{ft}^2$



# MTS Lead

- MTS employees clean their soldering area's at the end of the day.
- After the cleaning, post lead wipe sampling was completed after 3:30 pm to ensure the area's were properly cleaned.
  - Most of the area's were cleaned to  $<40$  ug/ft<sup>2</sup>, however three of the areas had lead levels  $>40$  ug/ft<sup>2</sup>.



# How can you protect yourself

- Use the local exhaust ventilation at the soldering stations during soldering operations if available.
  - Make sure it is close enough to capture any vapors from soldering.
- Wear disposable gloves when working with lead solder and/or wash hands after handling lead solder to help prevent ingestion, skin, or eye contact.
- Clean lead soldering areas daily with the D-Lead wet towel, alcohol wipes, mop, or use a HEPA vacuum to clean floors, tables, cracks, etc.
  - Wear disposable gloves when cleaning.
  - For very dirty areas, best practice would be to wear a disposable lab coat or paper Tyvek suit.
  - Place lead waste in safety waste cans located at the workstations.

# How can you protect yourself

- Do NOT use air hose to clean dust and debris due to dust regeneration into the air.
- Do NOT dry sweep dust and debris.
- Do not eat in the lead soldering area.
- If you go to lunch, or outside to smoke, wash hands first.
- Although not required employees can voluntarily wear dust masks to further reduce lead exposure.