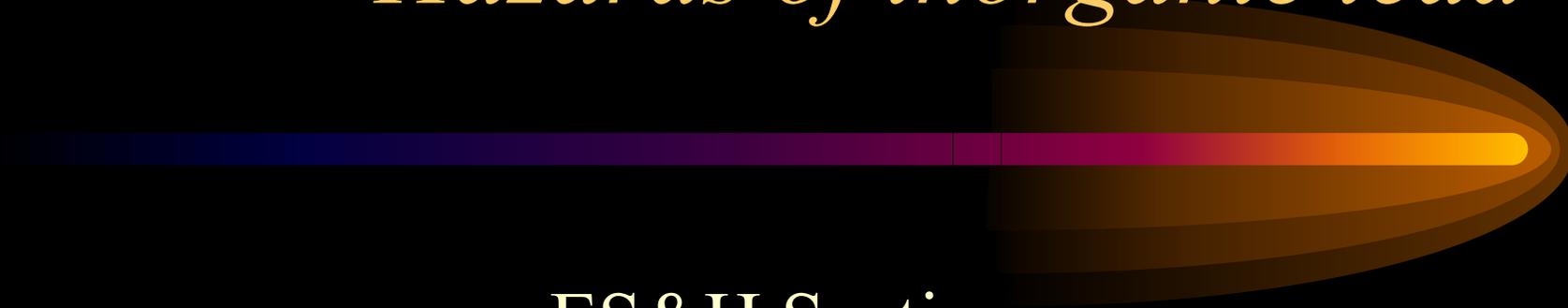


# *Hazards of inorganic lead*



ES&H Section

# *Objectives*

- What is lead?
- Sources of lead at Fermilab
- Health effects
- Exposure Limits
- Exposure Determination
- Engineering and Administrative controls
- Personal Protective Equipment
- Hygiene Facilities and Practices
- Lead Work Area and Housekeeping
- Medical Surveillance and Removal
- Recordkeeping

# *What is Lead?*

- Heavy, ductile, bluish-white solid element
- Comes in many forms (lead acetate, lead chloride, lead chromate, lead nitrate, lead oxide, lead phosphate, and lead sulfate)
- Properties
  - high density
  - softness
  - low melting point
  - resistance to corrosion
  - opacity to gamma and x-rays

# *Sources of Lead at Fermilab*



- Bricks
- Wool
- Plates/Sheets
- Slabs
- Paints
- Batteries
- Solder
- Ceramics

# *Health Effects*



- Absorbed by inhalation and ingestion
- Most enters the bloodstream; can accumulate in bone and organs
- Some excreted, some stored
- Acute exposures to high levels - seizures, coma, cardio-respiratory arrest
- Chronic exposure to low levels - anemia, damage to nervous, urinary, blood, bone and reproductive systems.

# *Symptoms of Lead Poisoning*

- Weakness
- Reproductive difficulties
- Nausea
- Fine tremors
- Gingival lead line
- Hyperactivity
- Sleeplessness
- Paralysis of wrist, ankles
- Facial pallor
- Headaches
- Poor appetite
- Dizziness
- Irritability/anxiety
- Constipation
- Excessive tiredness
- Numbness
- Metallic taste in mouth
- Muscle and joint pain

# *Exposure Limits*

- OSHA
  - Permissible Exposure Limit (PEL)
    - 50 ug/m<sup>3</sup> ( 0.05mg/m<sup>3</sup>)
    - 8 hour time weighted average
  - Action Level
    - 30 ug/m<sup>3</sup> ( 0.03mg/m<sup>3</sup>)
    - 8 hour time weighted average
    - triggers medical, PPE, training

# *Exposure Determination*

- Professional Judgement
  - Based on similar type work
  - Required to conduct air monitoring if no such data exists
- Compliance Program (including Hazard Analysis)
- Personal Exposure Monitoring
  - The following may result in exposures > Action level
    - Abrasive blasting, welding, cutting, and torch burning on lead containing paint (LCP)
    - Demolition of structures with (LCP)
    - Manual scraping, sanding of (LCP)
    - Spray painting LCP
    - Moving lead - bricks & sheet (FERMILAB required not OSHA)

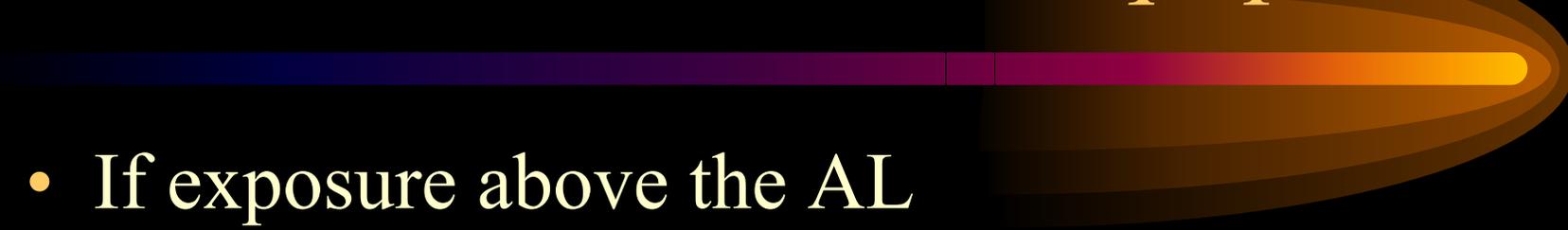
# *Exposure - lead bricks*

- PEL - 0.05 mg/m<sup>3</sup>
- AL - 0.03 mg/m<sup>3</sup>
- 1200 bricks - 0.31 mg/m<sup>3</sup>
- 1000 bricks - 0.56 mg/m<sup>3</sup>
- 500 bricks - 0.12 mg/m<sup>3</sup>
- 400 bricks - 0.03 mg/m<sup>3</sup>
- 200 bricks - 0.04 mg/m<sup>3</sup>
- 100 bricks - 0.03 mg/m<sup>3</sup>

## *Engineering/Administrative Controls*

- Required if exposure is above PEL
- Include
  - Local Exhaust ventilation
  - Wet surface
  - Containment/HEPA vacuum
  - Paint or use other barrier coating to cover surface
  - **NO** - dry sweeping, using non-HEPA vacuum, etc.

# *Personal Protective Equipment*



- If exposure above the AL
  - Respirator (PAPR if requested)
  - Coveralls with booties and hood
  - Clean off dust on clothing prior to removing respirator

# *Hygiene facilities and practices*

- Clean face and hands after leaving work area
  - Contaminated clothing and equipment should not leave work area
  - Shower
  - Separate clothing facilities

# *Lead Work Area and Housekeeping*

- Restricted Access
  - Label
    - Areas where exposure may exceed action level
    - Lead-containing materials
- No smoking, no food or beverages
- Area kept as clean as possible
  - Clean daily
  - Collect lead debris and contaminated items in closed container for hazardous waste disposal
  - Fermilab Standard - 0.05 mg/dm<sup>2</sup> surface concentration

# *Surface Lead Contamination Levels and Probability of not Exceeding Standards*

<b>Cs (mg/dm<sup>2</sup>)</b>	<b>P(%)</b>	<b>Comment</b>
<0.0001		Background
0.0004		"Clean" lead plate
0.0045	99.99	
0.0049	99.98	Mean wall PWBL pre-dcon
0.016	99.9	
0.020	99.8	Mean floor PWBL post-dcon
0.050	99.4	
0.070	99.0	
0.10	98.4	
0.26	95.0	
0.30	94.0	Mean floor PWBL pre-dcon
0.50	90.0	
1.0	86.0	
7.0	50.0	
10	42.0	
23	26.0	Highest wipe PWBL fire
80	10.0	
100	8.0	
600	1.0	

# *Lead Area Label*



WARNING  
LEAD WORK AREA  
POISON  
NO SMOKING OR EATING

# *Lead Hazard Label*



**Danger**

Lead

No eating, smoking or drinking

Contact SSO prior to working in area

# *Medical Surveillance and Removal*

- Required if you are exposed to lead above the AL for any one day
- Will not protect you if:
  - high lead level in body acquired over the years
  - non-occupational exposures
  - have condition that aggravated by exposure (kidney disease, anemia)
  - Variations in absorption rates

## *Medical (con't)*

- Exposure above AL more than 1 day but less than 30/year
  - initial blood test
  - follow-up test
- Exposure above AL for 30 or more days/year
  - complete medical exam
  - periodic blood test (6 months)

## *Blood Test*



- Blood Lead - test circulating levels of lead in blood
- Zinc Protoporphyrin (ZPP)
  - measures adverse metabolic effect of lead

# *Blood Test - Blood Lead*

- Acceptable -  $< 40\mu\text{g}/100\text{g}$  of whole blood (WB)
- If  $> 40 \mu\text{g}/100\text{g}$  WB
  - Retest every 2 months
- If  $> 60 \mu\text{g}/100\text{g}$  WB (2 tests)  
**REMOVE FROM LEAD WORK** till blood lead  $< 40 \mu\text{g}/100\text{g}$  WB (2 tests)
  - OSHA requires medical removal protection
    - same hourly rate of pay

## *Medical*

- If you are dissatisfied with Fermilab  
Medical - can select a second physician for  
independent analysis

# *Additional Information*

- Report any signs or symptoms immediately
- Right to a copy of air sampling and medical test results
- For further information:
  - OSHA 1926.62/ OSHA web site
  - Fermilab ES&H Manual 5052.3
  - Reference Books

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