

Baystate  Health

Chemical Exposure Monitoring in Healthcare

Part 1

Developing a Monitoring Program

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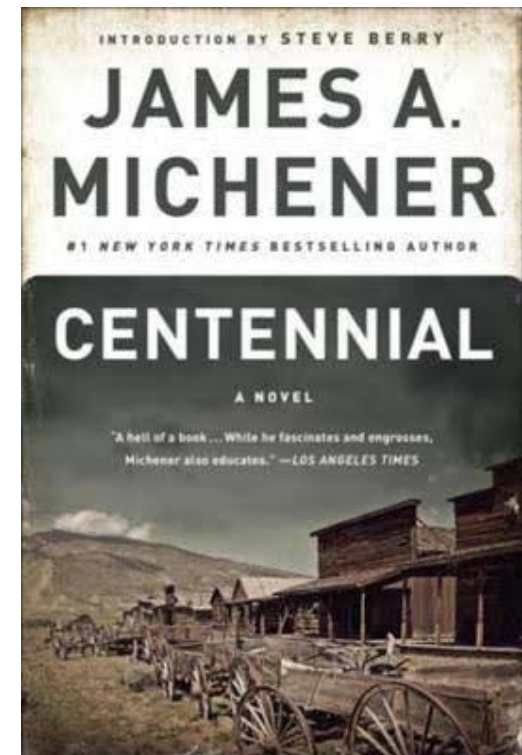
A little history

- 1970 – The OSHA Act is signed into law by Richard Nixon
- 1970 - 38 worker deaths a day
- 1972 - Worker injuries and illnesses are at 10.9 incidents per 100 workers
- 1974 - NIOSH published the first “Pocket Guide”
- 1987 – Formaldehyde Standard 29CFR1910.1048
- 1989 – Subpart Z is published
- 1992 – Formaldehyde revised



When I came to Baystate....

- Healthcare was still in a fee for service model, HMOs and cost containment were still new.
- Lots of guidance, but few standards.
- Understanding of chemical usage and exposure was very limited and compartmentalized.
- Unlike many manufacturing operations, chemical exposure in healthcare is like James Michener's description of the South Platte River, "a mile wide and an inch deep".



Assessment

- Survey the facility, department by department
- Establish directory of high use products and processes
- Risk assess processes for exposure routes
- Develop a sampling strategy
 - Active
 - Passive



Departments and Contaminants

- Pathology
 - Acetic Acid
 - Acetone
 - Ethanol
 - Formaldehyde
 - d-Limonene
 - Toluene
 - Methanol
 - Xylene
- Radiation Therapy
 - Cadmium
- LDRP
 - Nitrous oxide
- Surgery
 - Halogenated anesthetics
- Central/Sterile Processing
 - Ethylene Oxide
- Physician Offices
 - Glutaraldehyde
- Other
 - Radon

Management Aspects

- Use an AIHA Accredited Laboratory;
- Manage to the most protective guidance: PEL, TLV, REL, WEEL, STEL regardless of the exposure time;
- Utilize environmental samples as a QC/QA.
- PPE needs to be the last choice with the caveat of multiple hazards (hygiene, BBS);
- Data is widely shared with employees, managers, Employee Health;
- Provides an opportunity to education;
- Provides an opportunity to review for product substitution.

What have we learned....

- In general, people think their exposure is much higher than it actually is;
- There's a lot to be said for technique;
- People don't get ventilation;
- To many, Physics is smoke and mirrors;
- Not all physicians are scientists;
- Product substitution can be a good thing for the most part, however;
- Not everything can be monitored (o-phthalaldehyde);

Indoor Air Quality

- On average, we respond to about two dozen indoor air quality complaints per year.
- Employee reports are split Building Related Illness and Sick Building Syndrome.
 - BRI - a clinically diagnosable disease or condition (as Legionnaires' disease or an allergic reaction) caused by a microorganism or substance demonstrably present in a building.
 - SBS - a condition affecting office workers, typically marked by headaches and respiratory problems, attributed to unhealthy or stressful factors in the working environment such as poor ventilation.

Indoor Air Quality

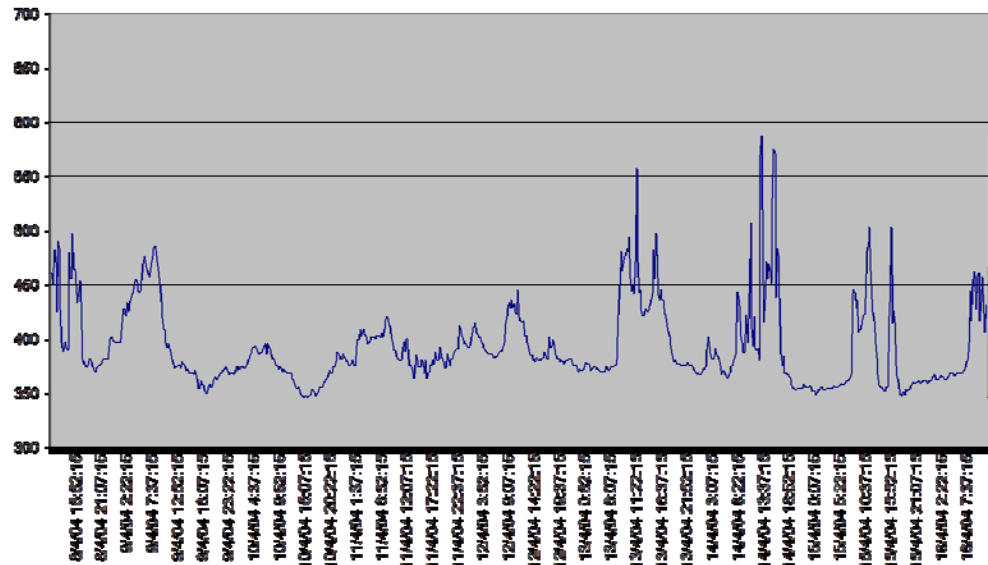
- Baystate has a standard “package”: Temperature, humidity, carbon dioxide, nuisance dust, formaldehyde, and, 2-butoxyethanol, and often, bioaerosols.



Indoor Air Quality

The electronic data set will provide information on ventilation efficiency and efficacy, temperature control and identify chronic low humidity conditions.

Figure # 2
280 Chestnut St. - HR Lynn Fogg's office
CO2 vs. Time



Indoor Air Quality

The laboratory analyzed samples provides information on common stressors that are the result of off-gassing from man-made furniture components, floor cleaning or poor housekeeping.

FORMALDEHYDE VAPOR ANALYSIS REPORT				
SAMPLE NO	SAMPLING DATE	NAME	EXPOSURE TIME(hr)	CONCENTRATION (ppm)
GD7726	05/19/16	Rm 17/1	7:30 – 15:00 = 7.50	0.03
Daly OR				

Lab ID: 1600751-03	Sample ID: FD3219	Date Sampled: Not Provided	
Sample Description: Blank		Matrix: 3M 3520 OVM	
<u>Analyte</u>	<u>Total Mass</u>		
2-Butoxyethanol	< 9.0 µg		
Lab ID: 1600751-04	Sample ID: 927-1168	Date Sampled: 03/18/2016	Air Volume: 880 Liters
Sample Description: C Level Office		Matrix: PVC Filter - preweighed	
<u>Analyte</u>	<u>Total Mass</u>	<u>Concentration</u>	
Total Particulates	< 100 µg	< 0.11 mg/m ³	

Indoor Air Quality

Mold is a popular culprit for air quality complaints.

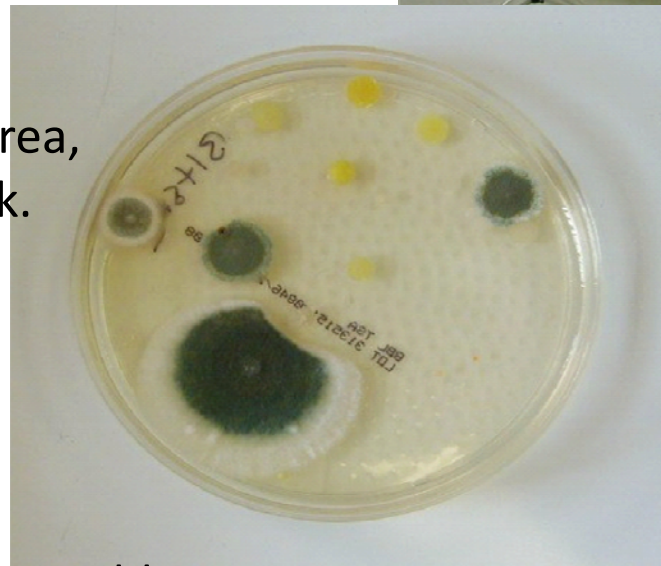
In reality, the indoor environment is considerably less contaminated with bioaerosols than outdoors.

Baystate uses Trypticase Soy agar as a general growth medium.

Four sample minimum: complaint area, non-complaint area, outdoors, blank.

Results are calculated as colony forming units per cubic meter, CFU/m³.

50-200 CFU/m³ are common and not problematic.



Questions?

Part 2

Case Study: Chemical Exposures in
the Morgue

BAYSTATE MEDICAL CENTER CASE STUDY: CHEMICAL EXPOSURES IN THE MORGUE

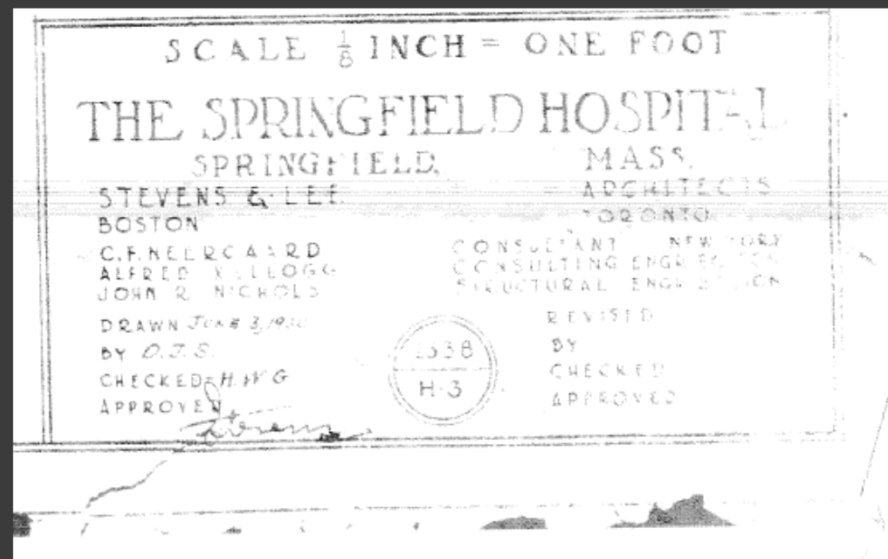
By: Elizabeth Guyette, MSM
Senior Safety Engineer

Overview

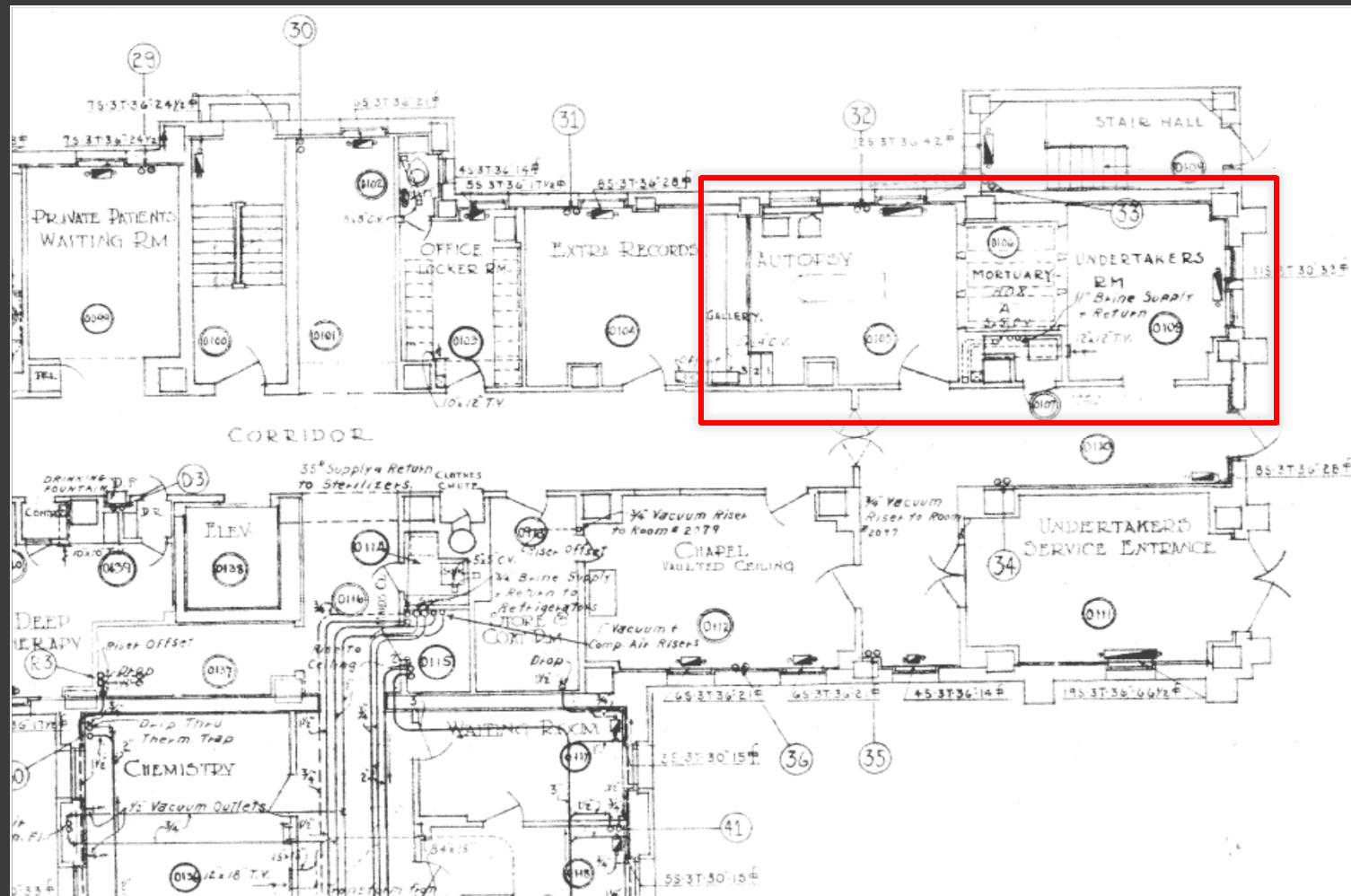
- ⦿ Floor plan
- ⦿ Autopsy defined
- ⦿ Why lung inflation
- ⦿ Formaldehyde hazards
- ⦿ Respiratory vs. Skin Exposure
- ⦿ Workstation configuration
- ⦿ Vapor Monitoring
- ⦿ Hierarchy of Controls & corrective actions

Building History

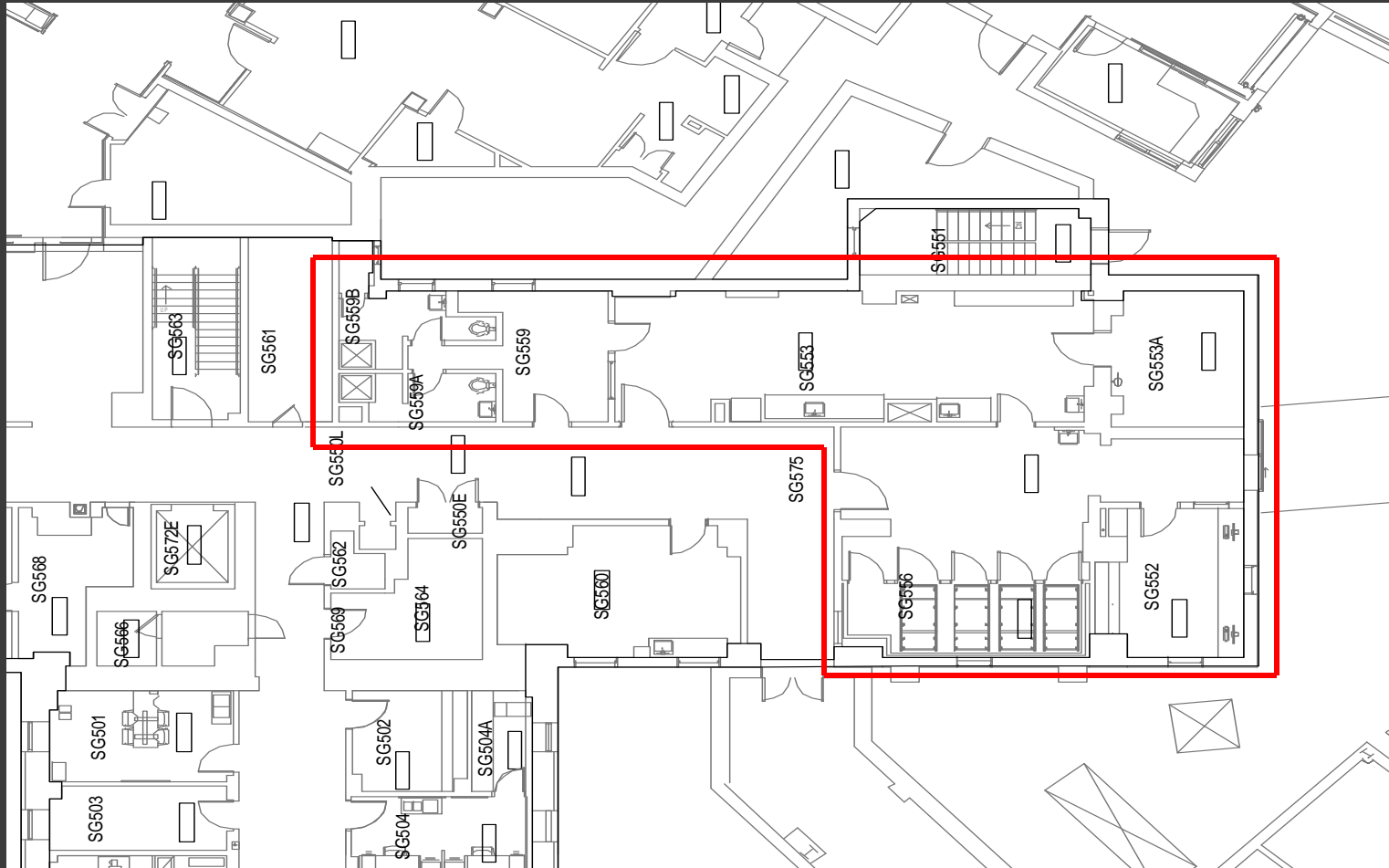
- Springfield Hospital
- Constructed in 1930



Always has been a Morgue



2015 Renovation



Down Draft Table

- Pulls vapors down and away



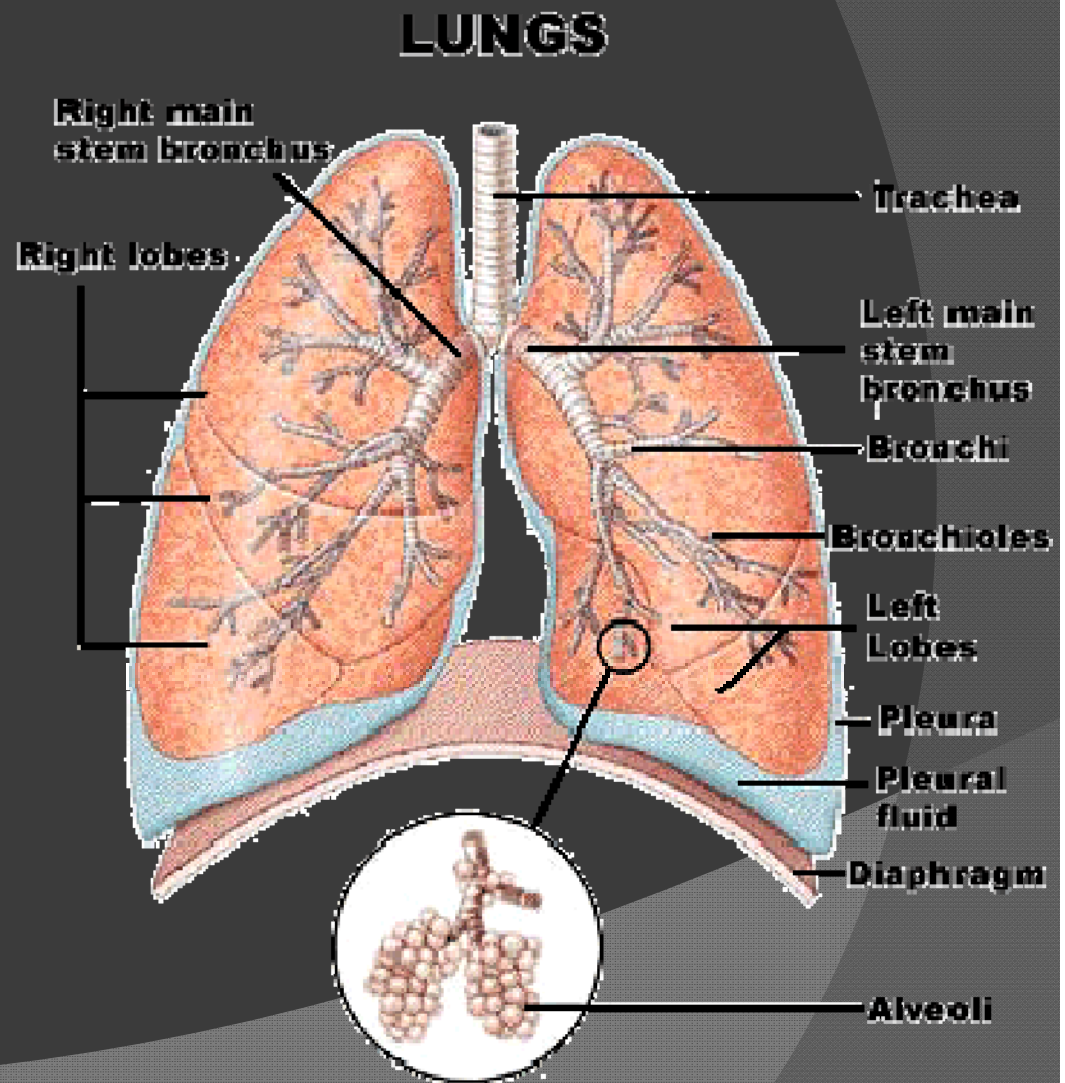
Reason for Autopsy

An autopsy is a medical procedure that consists of a thorough examination performed on a body after death, to evaluate disease or injury that may be present and to determine the cause and manner of a person's death.



Lung Inflation

- Helps to mimic breathing
- Expands lungs
- “Fixes” Organs



Formaldehyde vs. Formalin

- Formaldehyde:

- Consists of 37% formaldehyde to 100 mL of water.

- Formalin:

- 3.7% formaldehyde mixed with a buffer and water to reduce corrosivity but still maintains its' fixative properties.

Hazards of Formaldehyde

- ⦿ Sensitizing agent
- ⦿ Carcinogen
- ⦿ Acute Exposure
 - Irritation: eyes, nose, and throat
- ⦿ Chronic Exposure
 - Asthma-like symptoms
 - Skin irritation/dermatitis



Skin vs. Respiratory Exposure

Minimal Skin exposure

- Scrubs
- Cover-all's
- Gloves
- Eye Protection

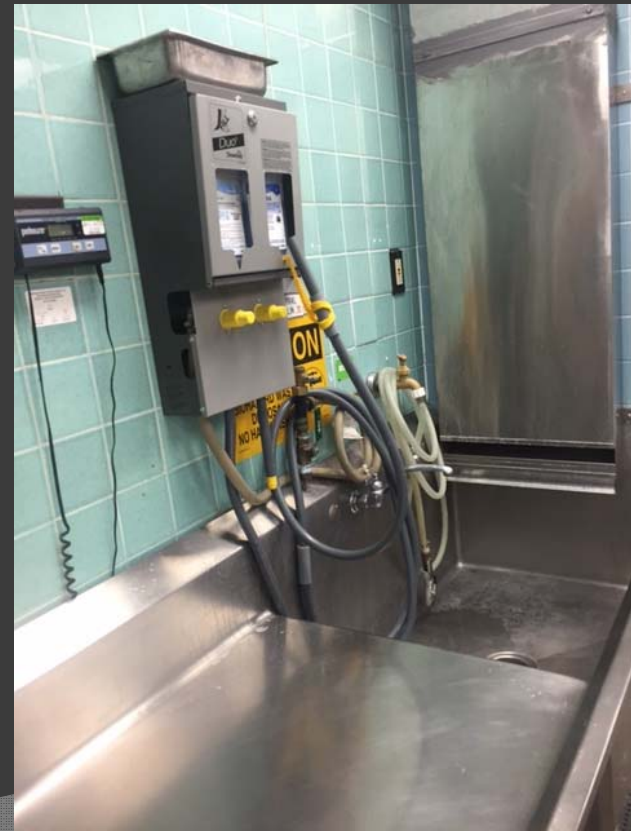


Respiratory Exposure

- PAPR w/ Formaldehyde Cartridge.
- Adequate Ventilation pulling away from process



Morgue Sink

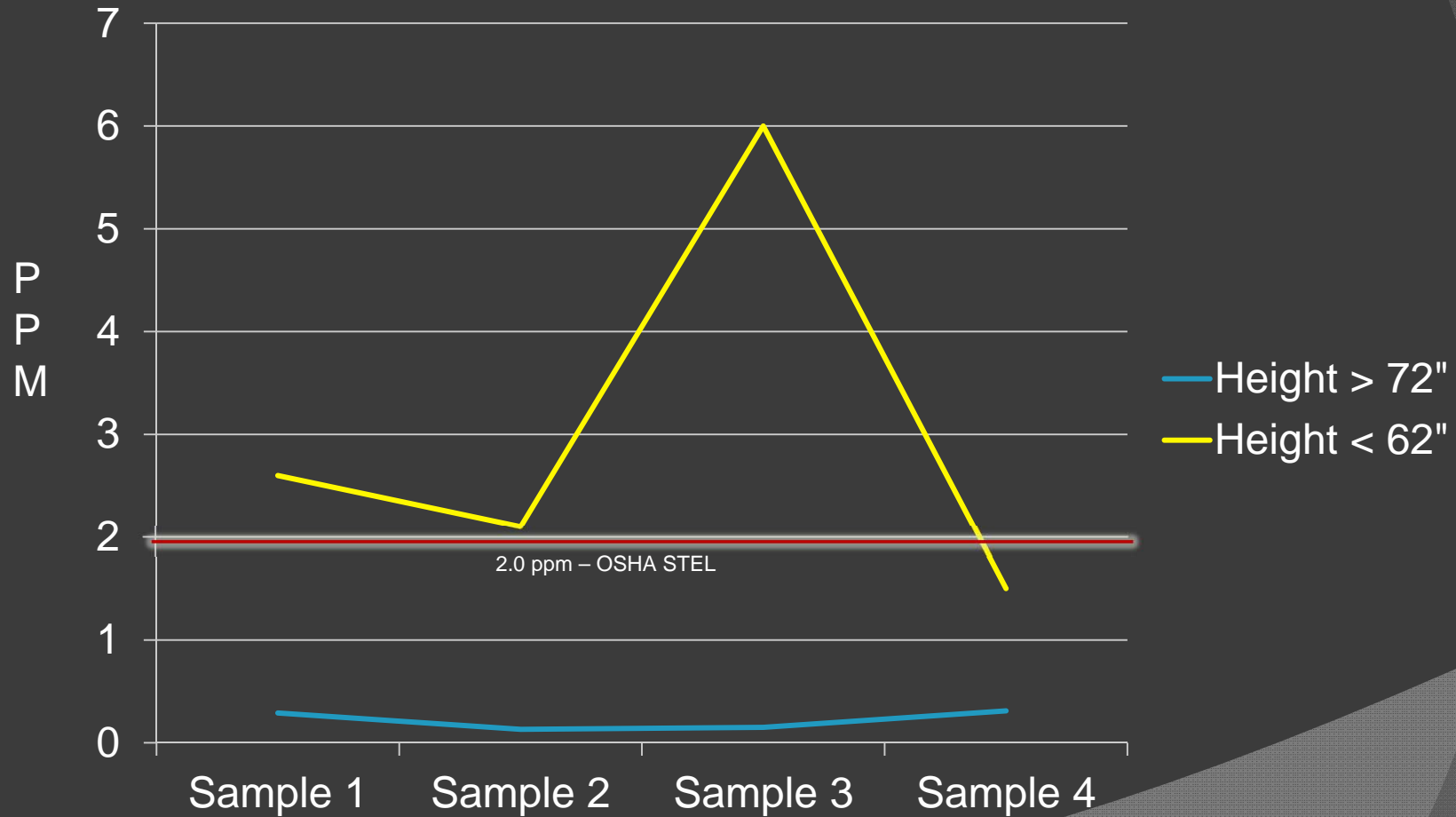


Sampling Methodology

- Both active and passive
- Personal and environmental samples



Vapor Monitoring Pre-Modifications



Creating a workstation to fit the employee

- Employee Height
- Flow Control
- Ventilation

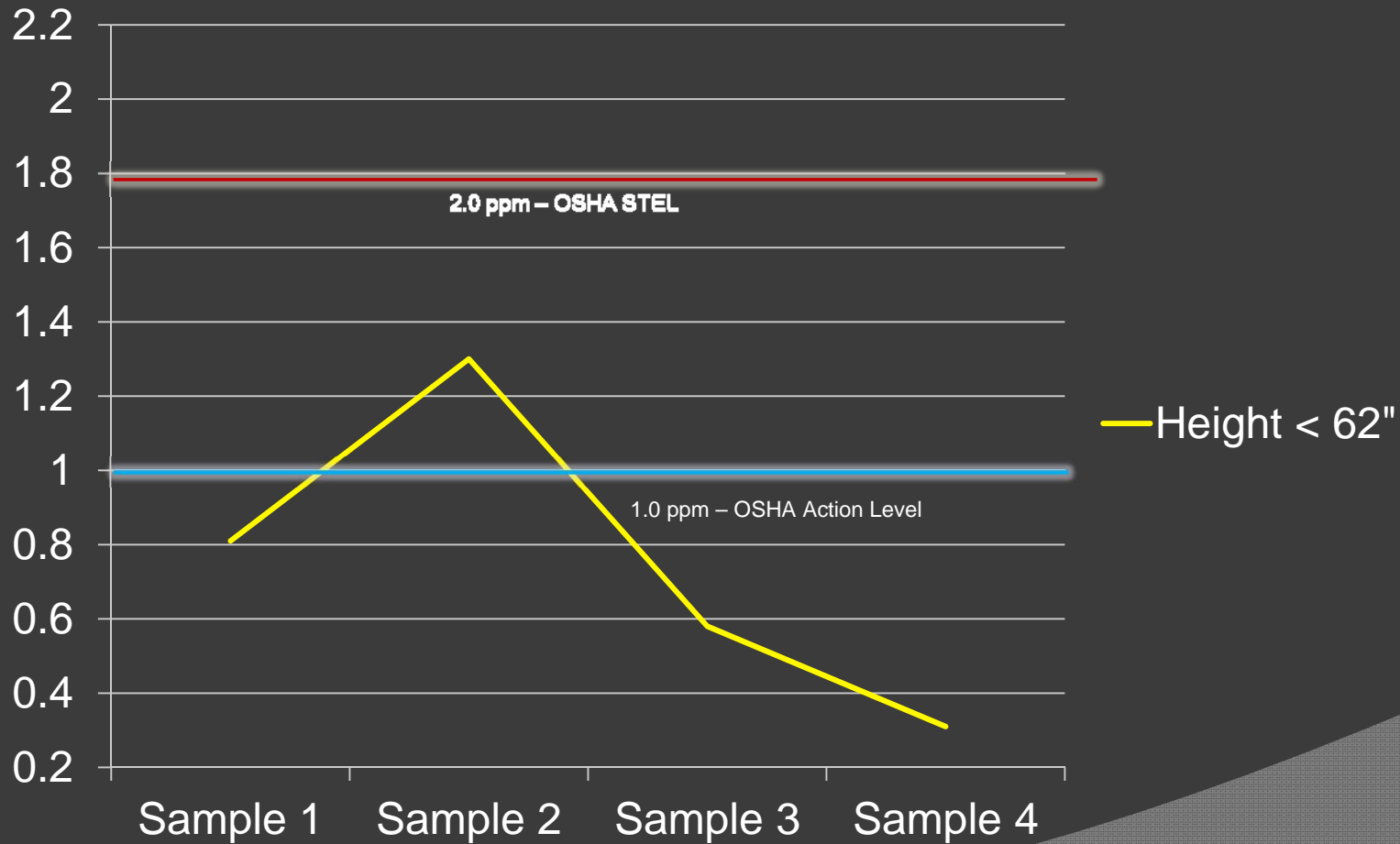


Visual Queues

- Green means GO
- Red means STOP
- Programmed to notify Engineering when not working



Vapor Monitoring Post-Modifications



Questions?

