Mercury in Flooring:
Testing and Remediation Requirements

Course Number: RC401106

Sean Miller

February 27, 2020

Rochester Colonial MFG. CORP.
The Window and Door Experts™

AIA CES Provider Number: 404108687

Professional Abatement Contractors of New York

PACNY

Credit(s) earned on completion of this course will be reported to AIA CES for AIA members. Certificates of Completion for both AIA members and non-AIA members are available upon request.

This course is registered with AIA CES for continuing professional education. As such, it does not include content that may be deemed or construed to be an approval or endorsement by the AIA of any material of construction or any method or manner of handling, using, distributing, or dealing in any material or product.

Questions related to specific materials, methods, and services will be addressed at the conclusion of this presentation.

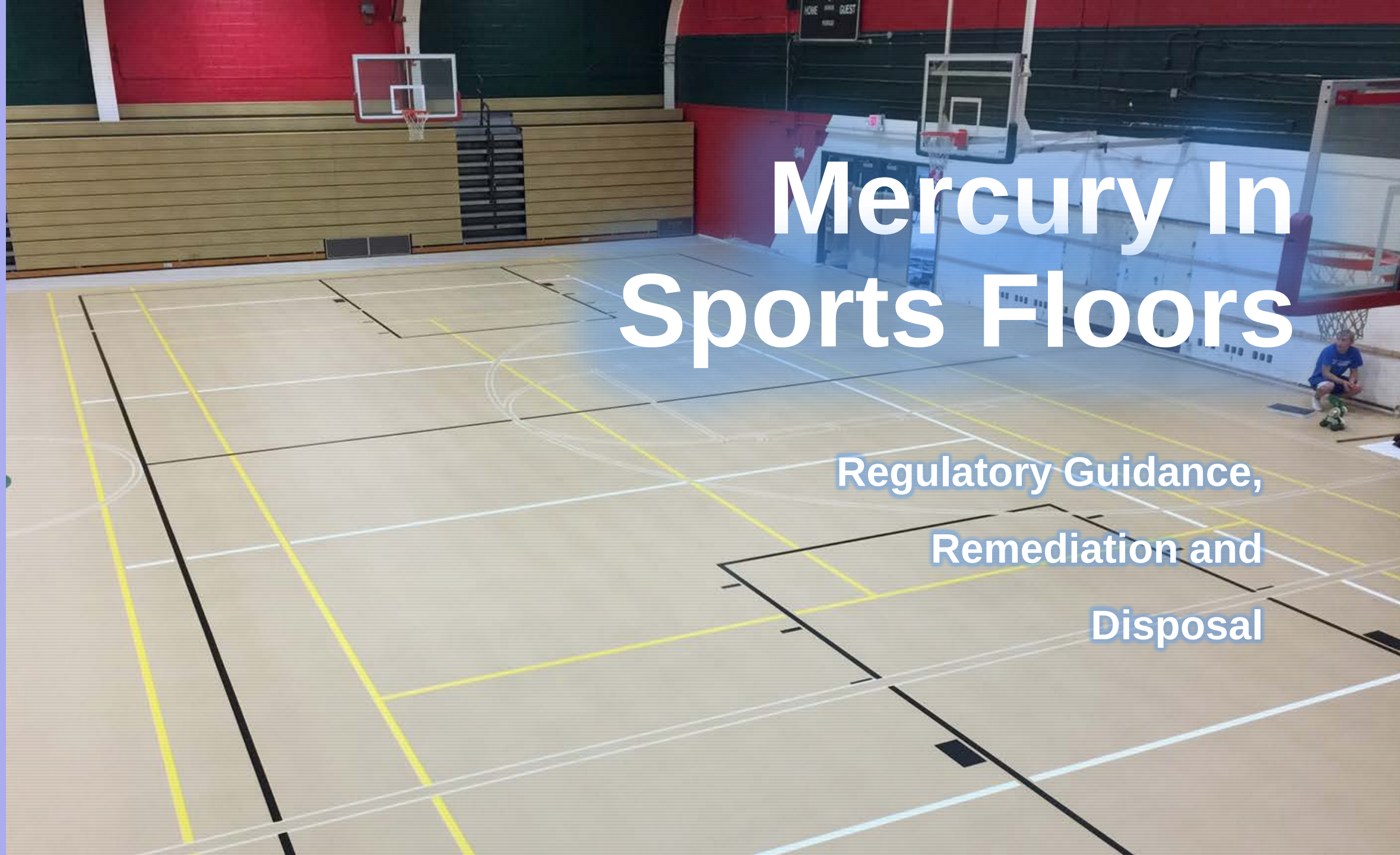
Course Description

This program provides an in-depth review of mercury flooring regulations and requirements, including where it's often found, identification, testing, and remediation.

Learning Objectives

At the end of the this course, participants will be able to:

1. Participants will be able to evaluate, by visual inspection of flooring conditions and review of available drawings showing as-built design, the physical state & adhesion of mercury flooring and select means & methods most likely to be effective in its removal.
2. Participants will be able to coordinate, based on the review of appropriate TCLP analytical results and hauler/landfill requirements, the proper characterization, manifesting, containerization, transportation, treatment, and disposal of waste streams generated by mercury flooring removal.
3. Participants will be able to avoid, based on selection of appropriate removal, handling, and control methods, the generation of unnecessary and/or excessive volume of RCRA hazardous waste or waste conditions that may be rejected by the disposal facility as off-spec.
4. Participants will be able to reduce, by selection and application of adequate engineering controls, mercury vapor levels generated during the remediation process.



Mercury In Sports Floors

Regulatory Guidance, Remediation and Disposal

Mercury Overview

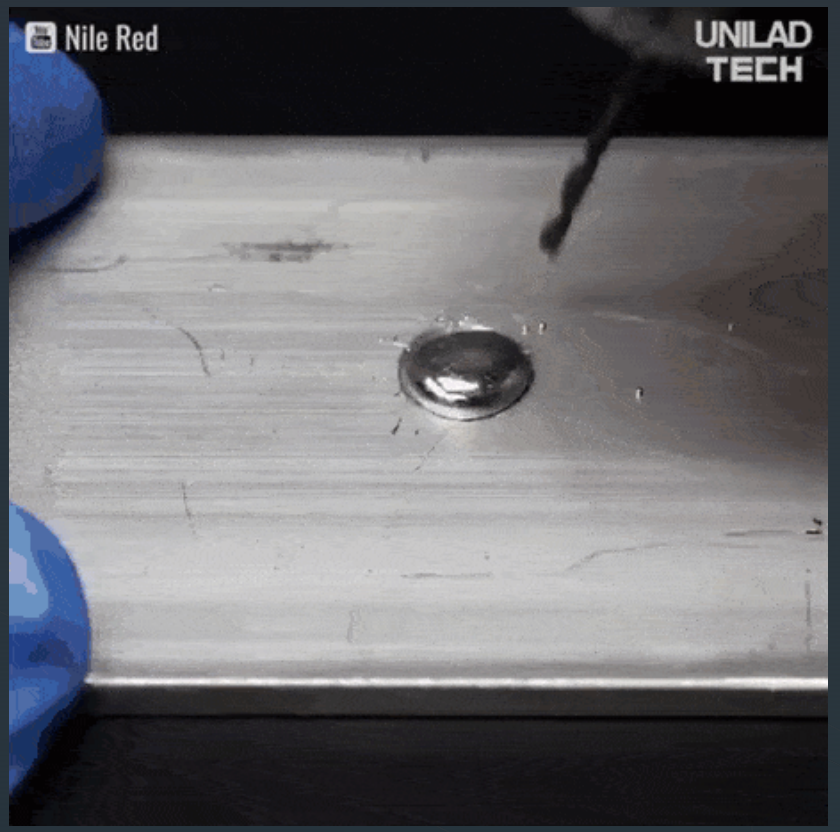
- Where is Mercury Found?
- Mercury Regulatory Levels
- NYS Guidance and Requirements
- Federal Guidance and Requirements

Where is Mercury Found?

- Elemental (Metallic) Mercury
- Inorganic Mercury Compounds
- Organic Mercury Compounds

Elemental Mercury

- Silver liquid
- Found in:
  - Thermometers
  - Switches/Thermostats
  - Natural Gas Regulators
- Emits colorless, odorless vapor
  - Rate roughly doubles with every increase of 10 degrees Fahrenheit above 60 deg.
  - Surface area is a factor
- Reacts with many other materials
- Forms amalgams with other metals
- Toxic



Inorganic Mercury Compounds

- “Mercury Salts”
  - Mercuric Chloride
  - Mercuric Iodide
  - Mercuric Oxide
- Used in Antiseptics, Disinfectants, Fungicides, Pesticides
- Formerly Common in Medications
- Also toxic

Organic Mercury Compounds

- Methylmercury
  - From Microbial Action on Mercury in the Aquatic Environment
  - Persistent Pollutant
  - Bioaccumulation
- Phenylmercuric Acetate (PMA)

Mercury Regulatory Levels

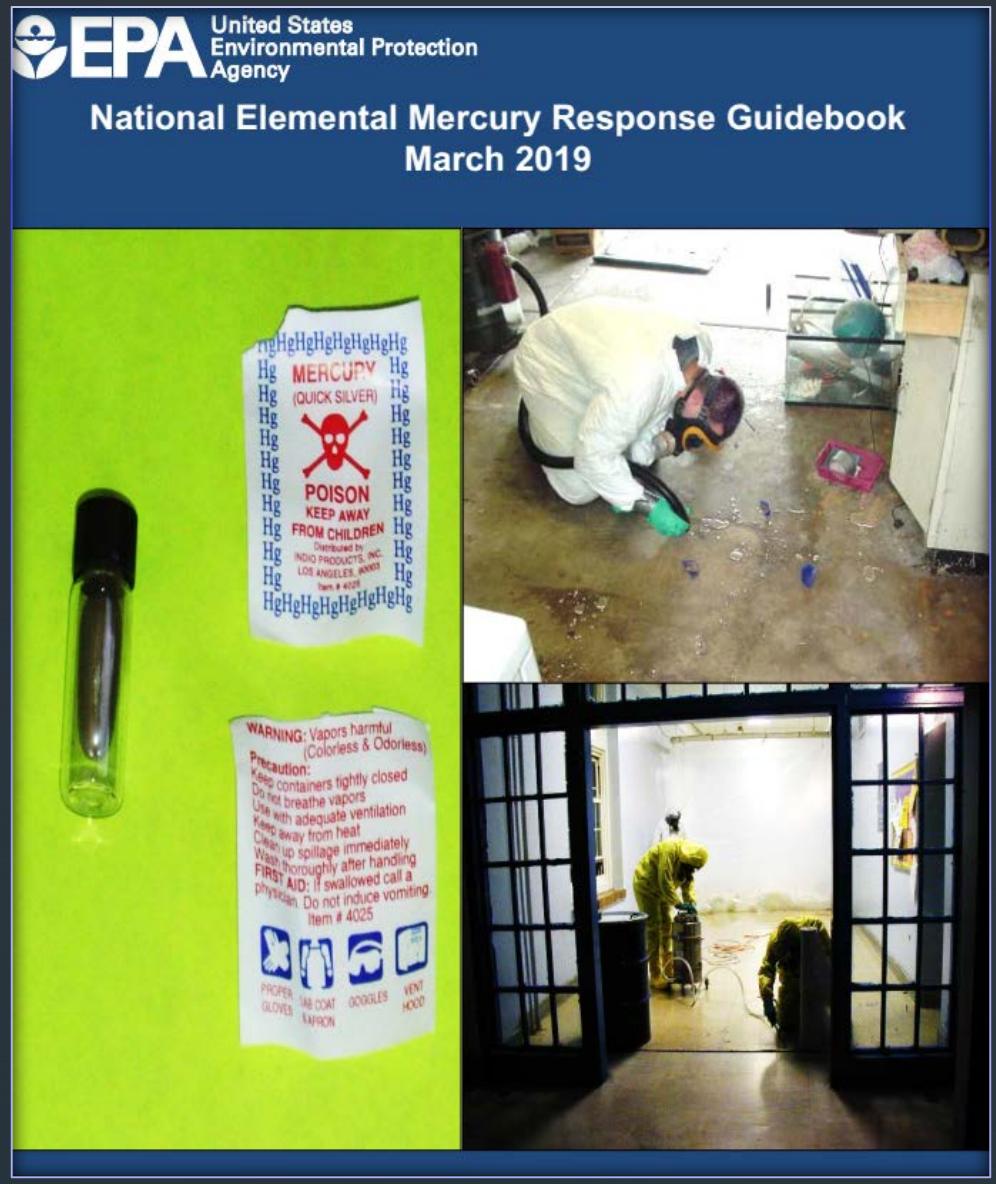
Regulatory Agency	Parameter	Regulatory Limit	Notes
OSHA	Respiratory	0.1 mg/m^3 (8-hr TWA , Ceiling)	Regulation, Occupational
NIOSH & MSHA	Respiratory	0.05 mg/m^3 (10-hr TWA) 0.1 mg/m^3 (Ceiling) 10 mg/m^3 (NIOSH IDLH)	Recommendation, Occupational
ACGIH	Respiratory	0.025 mg/m^3 (8-hr TWA, Ceiling)	Recommendation, Occupational
EPA & ATSDR	Respiratory	0.001 mg/m^3 (Continuous)	Recommendation, Residential
NYSED	Respiratory	0.00075 mg/m^3 (TWA) i.e. 750 nanograms	Regulation, 40 hours/week employee & 16 hours/week student
USEPA & NYSDEC	RCRA Disposal	0.2 mg/L (TCLP)	Regulation, RCRA Hazardous Waste
USEPA & NYSDOH	Drinking Water	0.002 mg/L	Regulation, Maximum Contaminant Level

NYS Guidance and Requirements

- NYSDEC
  - Disposal and Discharge Regulations
  - Spill Reporting/Response
  - Guidance Info on Website
- NYSDOH
  - Drinking Water Standards
  - Guidance Info on Website
- NYSED
  - More About That Later

Federal Guidance and Requirements

- USEPA
  - Mercury Guidebook
  - Extensive General Info
  - 192 Pages, One Paragraph About Mercury Sports Floors
- ATSDR
  - Agency for Toxic Substances and Diseases Registry
  - Part of Dept. of HHS
  - Technical Assistance

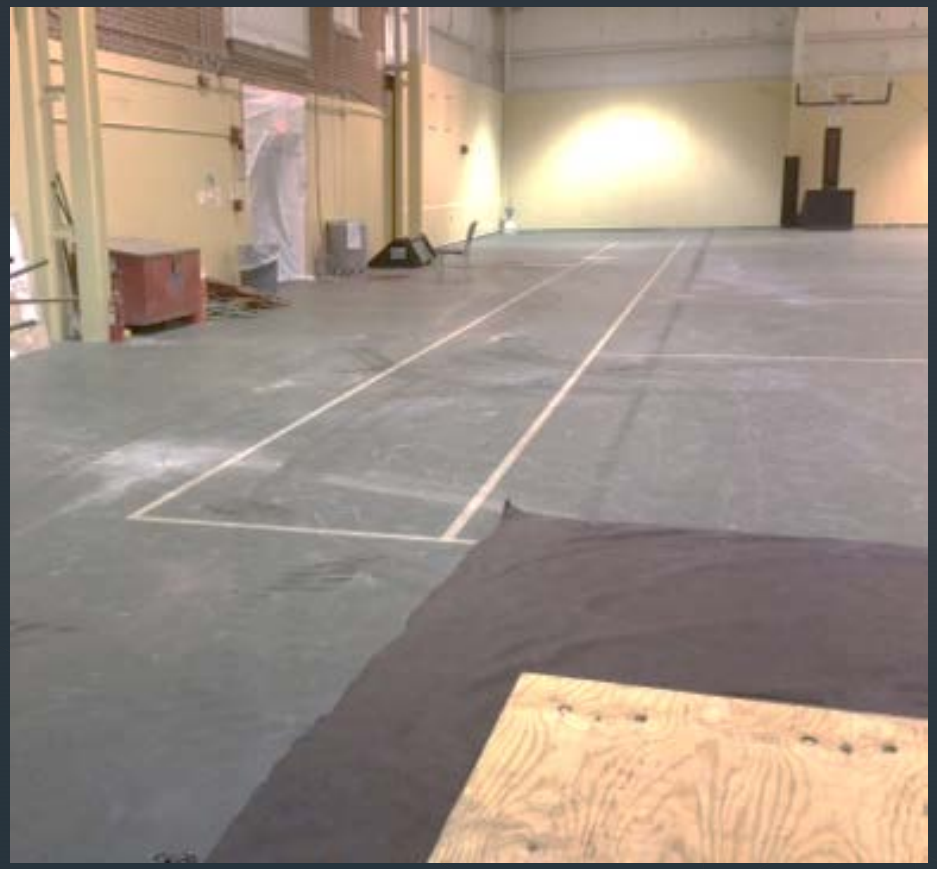


Mercury Sports Floors

- What is a “Mercury Sports Floor”?
- NYSED Guidance
- Guidance from Other States
- Bulk Sampling and Testing
- Vapor Measurement

What is a “Mercury Sports Floor”?

- Polyurethane Resilient Surface
  - Usually Poured In-Place
  - 3M Tartan and Others
  - Layering and Consistency Varies
- Gyms, Fieldhouses, Tennis Courts, Multi-Purpose Rooms, Cafeterias, and More
- May Contain Phenylmercuric Acetate (PMA)
  - Used as a Catalyst for Curing
  - Off-Gases Mercury Vapor at Varying Rates
  - Ventilation and Temperature Major Factors



NYSED/NYS Guidance & Rules

- June, 2019: NYSED issued a letter to all schools
  - Information on presence and identification of potential mercury-containing floors
  - Polyurethane floor inventory requested via online survey link
  - Recommendation to follow Minnesota guidelines (primarily monitoring/exposure management for building occupants)
- November, 2019: Gov. Cuomo approved legislation addressing mercury-containing floors in schools
  - Effective immediately
    - TWA exposure limit of 750 nanograms per cubic meter: 40-hour work week for employees, 16-hour school week for students
  - Beginning in 2021
    - No new mercury-containing floors
    - Remove mercury-containing floors before installing new floors

Guidance from Other States

- Minnesota
- New Jersey
- California
- Arizona
- More Expected

But it’s mostly about…

…Minnesota

- First Standards in 2007
- Referenced as Guidelines for Other States, Including NY
- Guidance for Testing & Mitigation Targeted to Environmental Professionals
- Guidance Criteria Include:
  - Determining Mercury Content
  - Exposure Guidelines
  - Detailed Testing Protocols

Bulk Sampling and Testing

- Safety
  - PPE
  - Proper Tools
  - Exposure Monitoring During Sampling
- Sample Collection
  - Multiple Locations
  - Full Depth, All Layers
  - Note Thickness, Layering, Consistency, Substrate
  - Sealing & Repair
- Analysis
  - TCLP and Total
  - Good Idea to Test for All 8 RCRA Metals

Vapor Monitoring

- Mercury Vapor Meter
  - Minimum Detection Limit: 300 ng/m^3
  - Single Read vs. Continuous
  - Datalogging
- Sampling Protocols
- Ambient Conditions
  - Ventilation
  - Temperature
  - Interferences

Mercury Sports Floor Remediation

- From a Contractor’s Perspective

It’s Not an Asbestos Job!

- Different Rules: No Definitive, Prescriptive Regulations
- Different Disposal: RCRA Hazardous Waste
- Different Contaminant Control Issues: Particulate vs. Vapor
- Different Training: Mercury-Specific & HAZWOPER
- Different Exposure Monitoring: Multiple Methodologies
- Different PPE: Respiratory, Ingestion, Skin Contact, Mucous Membranes
- Different Engineering Controls: HEPA vs. Activated Carbon, Wet vs. Dry, Vapor Suppression & Capture

Reading a Mercury Floor Spec

- Variable Requirements, From General Directions to Detailed Recipes
- No True Consensus on “The Right Way”
- Re-Purposed Abatement Specs
- Re-Purposed Elemental Mercury Specs
- Analytical: Total Hg vs. TCLP
- Incompatible Conditions
  - Work Area Prep, Engineering Controls & Equipment, Clearance Criteria, Waste Handling
- Contingencies/Concealed Conditions
- Use the RFI Process

Estimating a Mercury Floor Project

- Quantification – Thickness as Important as Square Footage
- Density & Consistency
  - Old-Style Tartan vs. Modern Sports Surfaces
  - Multiple Layers, Fiberglass Inlay
  - Adhesion
  - Substrate Condition
  - Uncured/Reverted Material
- Disposal Pricing
- Consumables
  - Exposure Monitoring, Carbon Filters, Vapor Suppressant/Cleaning Solutions, Disposal Packaging, Respirator Filters, Suits, Gloves

Worker Training, Monitoring & PPE

- Employee Qualifications
- Exposure Monitoring
- PPE

Employee Qualifications

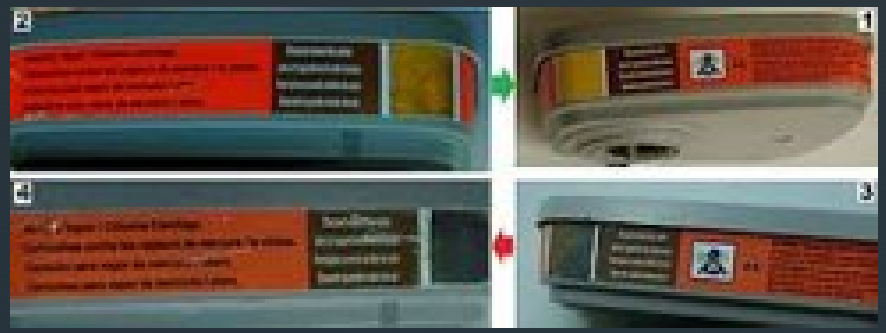
- 40 Hour HAZWOPER?
- Mercury-Specific Training/HazCom
- Site Workplan/HASP Training
- Respiratory Protection Program
- Experience

Exposure Monitoring

- Medical Monitoring – Pre & Post
- Respiratory Exposure Monitoring
  - PEL (and Ceiling) only 0.1 mg/m3
  - Multiple monitoring options – passive vs. active, real time vs. lab, badges, tubes
  - Laboratory availability issues
  - Ambient screening

PPE

- Respirators – typically full-face using Hg vapor cartridges with end-of-service life indicator
- Skin protection – impermeable suits and impermeable gloves
- Eye protection – tight seal, no vents



Work Area Prep & Engineering Controls

- Isolation
- Surface Protection
- Decontamination
- Negative Air
- Mercury Vacuums
- Vapor Suppressants
- Localized Vapor/Particulate Capture

Isolation

- HVAC Shutdown
  - Test before prep – may already be contaminated
- Critical Barriers
  - Vapor Permeation
  - Think of odors from an asbestos work area
- Hardwall Isolation Barriers
  - Necessary or not?

Surface Protection

- Plasticizing
  - Test before prep – may already be contaminated
  - Fixed objects?
  - One layer or two?
  - Tent enclosures?

Decontamination

- Personal
  - OSHA 3-stage
  - Other specs
- Waste
  - Build to suit and/or per specs
  - Transfer route to roll-off

Negative Air

- HEPA and Activated Carbon Filters
- Test Exhaust
- CFM More Important
- Scrubber Units
- Watch the Temperature

Mercury Vacuums

- HEPA and Activated Carbon Filters
- Test Exhaust
- No “Lab” Vacuums

Vapor Suppressants

- Solutions
  - Amalgamating
  - Chelating (EDTA)
  - Cleaning
  - Pre-mixed vs. Field-mixed
- Granular Products

Localized Vapor/Particulate Capture

- Capture Before Dispersal
- Shrouded Tools
  - Dust Collectors with HEPA and Activated Carbon Filters
- Scrubber NAUs
- Covering Disturbed Material

Removal Methodology

- Multi-Step Process
  - Bulk Removal
  - Adhered Residual
  - Substrate Cleaning
  - Cracks, Joints & Penetrations
- Best Tool? It Depends…
- Sequencing of Steps
- Intact Removal (Note TSDF Reqs.)
- Waste Staging
- Water Is Not Your Best Friend

Contamination Control, Cleaning & Clearance

- Minimize Vapor (and Particulate) Generation
- Limit Dispersal of Vapor and Particulate
- Vacuuming and Wet Cleaning
  - Mercury vacs
  - Cleaning/Vapor suppressant solutions
- Entrained Contamination
  - Leaching into/from substrate
  - Residual material in joints, cracks & penetrations
- Inspection & Monitoring Interferences
  - Dusting from substrate
  - Moisture
  - Hypochlorite (bleach)

Waste Handling, Transportation & Disposal

- Waste Drives the Whole Show
- Identify and Obtain Disposal Pricing From a TSDF as Part of the Bid Process
- Analytical
- Waste Characterization and Profiling
- Containerization
- Avoiding Off Spec Waste
- Manifesting
- Hauling
- At the TSDF

Waste Drives the Whole Show

- RCRA Hazardous Waste
- Land Disposal Restriction (LDR)
- High Cost
- High Liability
- Fussy TSDFs
- Consider using an experienced turn-key waste broker
- Avoid misclassifying waste as hazardous

Identify and Obtain Disposal Pricing From a TSDF as Part of the Bid Process

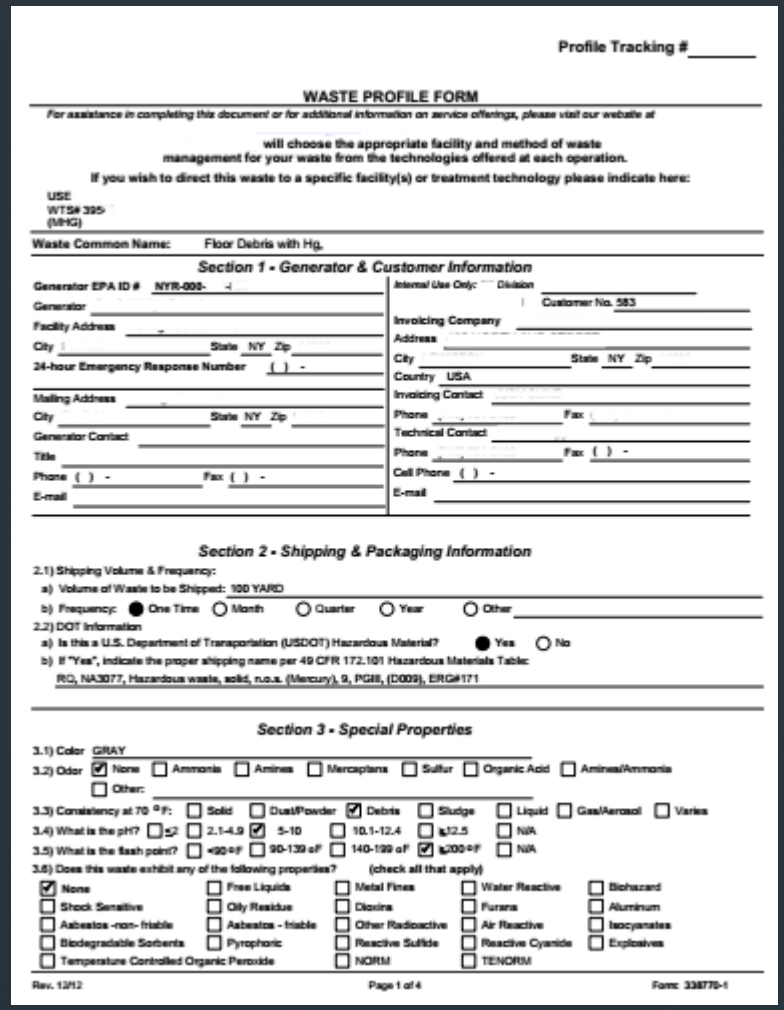
- TSDF will dictate requirements for analytical, profiling, approvals, containerization, etc.
- Verify permit & QC relating to mercury debris
- Analytical required for verification & pricing
- Read the fine print and add up *all* the costs
  - Spotting Fees, Container Rental, Liners, Hauling, Treatment/Disposal, Load Minimums, Taxes, Surcharges
- Usually priced on volume, not weight

Analytical

- TCLP vs. Total Hg
- RCRA Hazardous Limit (TCLP) = 0.2 mg/L
- 20-to-1 Rule
- 260 mg/kg Total Hg Limit: Not applicable to flooring debris

Waste Characterization and Profiling

- Generator EPA ID No.
  - Large vs. Small Quantity Generator
  - Authorized Representative
- Accurate Waste Description
- Include flooring debris and any ancillary waste (spent PPE, filters, poly, etc.) in description



Profile Tracking # _____

WASTE PROFILE FORM

For assistance in completing this document or for additional information on service offerings, please visit our website at

will choose the appropriate facility and method of waste management for your waste from the technologies offered at each operation.

If you wish to direct this waste to a specific facility(s) or treatment technology please indicate here:

USE
WTS# 395-
(MHG)

Waste Common Name: Floor Debris with Hg

Section 1 - Generator & Customer Information

Generator EPA ID # NYR-000- -4
Generator
Facility Address
City State NY Zip
24-hour Emergency Response Number ( ) -
Mailing Address
City State NY Zip
Generator Contact
Title
Phone ( ) - Fax ( ) -
E-mail

Internal Use Only: Division
Customer No. 583
Invoicing Company
Address
City State NY Zip
Country USA
Invoicing Contact
Phone Fax
Technical Contact
Phone Fax ( ) -
Cell Phone ( ) -
E-mail

Section 2 - Shipping & Packaging Information

2.1) Shipping Volume & Frequency:
a) Volume of Waste to be Shipped: 100 YARD
b) Frequency: ● One Time ○ Month ○ Quarter ○ Year ○ Other
2.2) DOT Information
a) Is this a U.S. Department of Transportation (USDOT) Hazardous Material? ● Yes ○ No
b) If "Yes", indicate the proper shipping name per 49 CFR 172.101 Hazardous Materials Table:
RQ, NA3077, Hazardous waste, solid, n.o.s. (Mercury), 9, PGIII, (D009), ERG#171

Section 3 - Special Properties

3.1) Color GRAY
3.2) Odor ☑ None ☐ Ammonia ☐ Amines ☐ Mercaptans ☐ Sulfur ☐ Organic Acid ☐ Amines/Ammonia ☐ Other:
3.3) Consistency at 70 °F: ☐ Solid ☐ Dust/Powder ☑ Debris ☐ Sludge ☐ Liquid ☐ Gas/Aerosol ☐ Varies
3.4) What is the pH? ☐ ≤2 ☐ 2.1-4.9 ☑ 5-10 ☐ 10.1-12.4 ☐ ≥12.5 ☐ N/A
3.5) What is the flash point? ☐ <90 oF ☐ 90-139 oF ☐ 140-199 oF ☑ ≥200 oF ☐ N/A
3.6) Does this waste exhibit any of the following properties? (check all that apply)

☑ None	☐ Free Liquids	☐ Metal Fines	☐ Water Reactive	☐ Biohazard
☐ Shock Sensitive	☐ Oily Residue	☐ Dioxins	☐ Furans	☐ Aluminum
☐ Asbestos -non- friable	☐ Asbestos - friable	☐ Other Radioactive	☐ Air Reactive	☐ Isocyanates
☐ Biodegradable Sorbents	☐ Pyrophoric	☐ Reactive Sulfide	☐ Reactive Cyanide	☐ Explosives
☐ Temperature Controlled Organic Peroxide		☐ NORM	☐ TENORM	

Rev. 12/12 Page 1 of 4 Form: 338770-1

Containerization

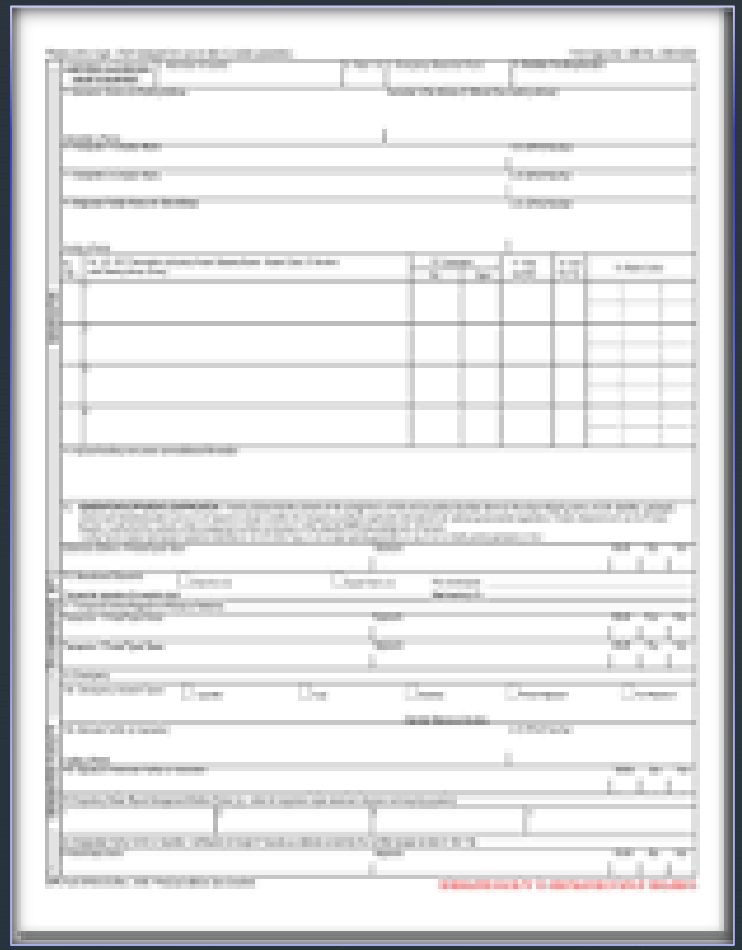
- Bags – usually NO
- Lined DOT-spec fiber drums or boxes
- DOT-spec. steel or poly drums
- Lined bulk roll-offs
- Labeling

Avoiding Off-Spec Waste

- Characterize/Profile/Manifest Accurately
  - Include all components in waste description
- No Free Liquids
- Adhere to Container Requirements
- Debris Properly Sized

Manifesting

- Universal Format
- Cradle to Grave Tracking
- Multipart Form with 6 copies:
  - Generator State
  - Disposal State
  - Generator
  - Transporter
  - Disposal Facility
  - Facility to Generator
- LDR Form Must Accompany Manifest
- Authorized Generator Representative



Hauling

- Hazardous waste permitted transporter
- Roll-offs must be lined regardless of waste packaging
- Loads must be tarped and watertight
- Scheduling

At the TSDF

- Load Inspection
  - Accept
  - Reject
    - Return to site
    - Keep but with off-spec charges
- Treatment
  - Microencapsulation
  - Macroencapsulation
  - Retort/Roasting
- Landfill

Project Closeout

- Disposal Documentation
  - Waste Profile
  - Completed Manifests/LDR
  - Certificate of Disposal
- Exposure Monitoring Records
- Employee Documentation
- Log Books
- Work Plan & HASP

This concludes The American Institute of Architects
Continuing Education Systems Course

Rochester Colonial
MFG. CORP.
The Window and Door Experts™

AIA CES Provider Number: 404108687

Contact: Kevin Hutton

KevinH@RochesterColonial.com

Professional Abatement Contractors of New York

PACNY

THANK YOU!

Presentation Provided By

Stephen R. Gheen, PE

Gheen Engineering, PLLC

And

Sean Miller & Mike Mazzara

GENESEE ENVIRONMENTAL