TABLE OF CONTENTS

1.0 INTRODUCTION/SCOPE

The School Facilities Board (SFB) recently became aware that a certain kind of rubberized flooring, typically used in school gymnasiums, multi-purpose rooms, cafeterias, and possibly in classrooms, has the potential to off-gas mercury vapors during the wear and tear of the flooring. The presence of the flooring does not automatically present a concern.

The SFB conducted a survey of school districts to determine whether these types of floors might be installed in any school. Based on survey responses, SFB will dispatch an assessment team to confirm whether the floor is in fact a suspected rubberized floor. If confirmed, SFB will coordinate with a third party consultant to perform both bulk floor and air sampling. The purpose of the air sampling is to determine whether a health risk exists.

This sampling plan lays out the specifications that shall be used when conducting sampling at an identified school. The sampling plan was prepared by the task force, consisting of the SFB, Arizona Department Health Services, and Arizona Department of Environmental Quality. These specifications shall be used regardless of whether SFB or a school performs the testing. For all testing SFB conducts, it will maintain all test records until the relevant flooring is removed from the premises. SFB further requests that any school district conducting its own independent tests provide all test results to SFB so that it can maintain these records until the determined flooring is removed from the school. SFB also recommends any school district conducting independent tests also maintain all test records for the same duration.

2.0 BULK SAMPLING OF THE FLOOR

The purpose of the bulk sample is to:

1) Confirm that mercury exists in the flooring material and
2) Provide a data point to assist in the risk decision process.

Bulk sampling protocol:

The flooring that is being assessed is commonly known as Tartan flooring, and was marketed under other names as well. It is a rubberized flexible flooring usually laid out as a base flooring directly on top of a concrete slab, or some other substrate. You may have the main wood floor, a composite secondary flooring (laid out on a channel system on top of the rubberized type flooring), or a mat that gives the floor more bounce. Be aware that the rubberized flooring is the item that may contain mercury. All different layers and separate pours should be analyzed to see if they contain mercury or have absorbed mercury from adjacent layers.

Below are the protocols for the bulk sampling:

- One bulk sample shall be collected from each floor, pour, and/or overlay/underlay. The Vendor shall record the sample location (Appendix A) and document the type and/or layers of the bulk sample collected.
- The Vendor shall collect the sample from the edge of the flooring, to minimize damage.
- Sample size should be ½ inch square and full thickness material.
- Efforts shall be taken to seal the sample location, if possible.
- The Vendor shall follow sample collection/preservation protocols listed in SW-846 for analytical method 3050B/6020A (United States Environmental Protection Agency, 1996 and 2014). SW-846, or Test Methods for Evaluating Solid Waste: Physical/Chemical Methods compendium, is the United State Environmental Protection Agency's official collection of methods for use in complying with the Resource Conservation and Recovery Act regulations.
- The sample(s) shall be submitted to an independent Arizona-certified laboratory with a turnaround time of 1 to 3 days. Analysis requested shall be merely for total mercury.
- The Vendor shall report analytical results in parts per million (ppm) for initial determination of mercury levels and record in the data spreadsheet (Appendix B).
- The Vendor shall provide an air and bulk sampling report to the SFB within 4 working days. The report shall include the appropriate attached supporting documents for each facility sampled.

Special Notes Specific to Identification of Mercury Containing Flooring based on Bulk Sampling Results

If mercury concentrations are less than 1 ppm, it can be assumed that the flooring was not manufactured using a mercury containing catalyst.

If mercury concentrations are greater than 1 ppm and less than 20 ppm, it is unlikely that exposures to mercury vapor in the gym could reach levels of concern. However, proper floor maintenance, adequate ventilation, and periodic air testing should take place to document levels are not exceeded.

If mercury concentrations are 20 ppm or greater, the concentration in the space may approach or exceed levels of health concern under specific conditions. Removal and disposal should be considered, but active ventilation could be a temporary option.

Please see the Decision Tree in Appendix C for additional information.

3.0 AIR SAMPLING

The purpose of the air sampling is to quickly determine if mercury concentrations in indoor air are at levels of public health concern. Agency for Toxic Substances and Disease Registry (ATSDR) has recommended an action level of 3 microgram per cubic meter (μg/m^3) for non-residential settings (such as schools); 1 μg/m^3 is recommended for residential settings (24 hour/day and 7 days/week). These values were determined based on the lowest known toxic concentration for human health of 10 μg/m3.

Below are the protocols for the air sampling:

- Samples shall be collected by using either a Jerome J505 or Lumex mercury vapor analyzer. Equipment shall be calibrated in accordance with manufacturer instructions. Calibration records shall be retained and submitted with the final report. Real time instant read air samples will be collected from selected location using manufacturer's recommended sample times.
- The room containing the flooring to be tested shall be gridded into equal spaces that shall not exceed 250 square feet and no closer than 6 feet from any wall and shall be reflected on the sampling plan that will be included into the final report submitted by the testing agency. If more than one heating, ventilation, and air conditioning (HVAC) unit services the space, the plan will reflect which zones are approximately associated with each HVAC unit so the correct ventilation rates can be recorded on the record table. This is to be recorded in the map (Appendix A) and the data record (Appendix B).
- Samples shall be collected from the following breathing zones:
    - Breathing zone should be chosen based on the lowest grade level at the school. If a school contains any grades Kindergarten to 8th grade, then breathing zone should be taken at 3 feet. If a school's lowest grade is between grades 9-12, then breathing zone should be taken at 5 feet.
- Samples shall be collected following these steps:
    - Set all sensor points and thermostats at 75 degrees;
    - Run the HVAC system for a minimum of 4 hours before testing
    - At the time of sampling, the building should be between 68 and 80 degrees(^{o}) Fahrenheit (F);
    - Turn off HVAC system for 20 minutes;
    - Begin sampling.

  Prior to air sampling, the vendor shall insure the required temperature range specified above is within protocol. If the temperature range is outside the required specifications sampling shall cease and SFB notified immediately.
- Using the example sample location map (Appendix A), multiple sample points must be selected to adequately represent the room(s) to be sampled. The size and number of grid samples will be

dependent on the size of the area to be sampled and shall conform to the areas and specifications mentioned above, e.g., 250 square feet maximum per grid, HVAC ventilation, etc. Document sampling results on the sample location plan and log into data logging table (Appendix B) that will then be submitted electronically in the file provided to the Vendor. The provided electronic file is not to be modified by the Vendor.

- Measurements with the mercury vapor analyzer will be taken on the manufacturer's average time at each selected data point for the sampling equipment.
- Collect indoor air samples from other rooms connected to the room with rubberized flooring. If the connecting room(s) have separate HVAC systems, they are to be measured as previously mentioned and noted on the sampling plan as if they were in the same space as the rubberized floor.
- Outdoor air samples using the same sample height for the respective school will be collected in order to establish a background. Three (3) background samples shall be collected approximately 5 feet from the main entrance and twenty feet to each side of the main entrance. The location of the background samples shall be documented and submitted along with the other sampling data.
- The Vendor shall provide an air and bulk sampling report to the SFB within 4 working days. The report shall include the appropriate attached supporting documents for each facility sampled.

3.1 8 HOUR INDOOR AIR MONITORING

This section will be applied in cases only where the initial test samples indicate elevated levels of mercury vapor, but determined not high enough to cause immediate action (Level C or D, per Appendix C), or sample test results causing enough quality assurance/quality control concerns that may require retesting of a particular floor or space. This will also apply to floors that will not be remediated immediately and will need semi-annual or annual monitoring to assess risk levels until remediation will be required (Level C, per Appendix C).

The use of air pumps with sorbent tubes analyzed using the Occupational Safety and Health Administration Method (OSHA) ID-140 (OSHA, 1987) and Lumex/Jerome Style meters are common methods of collecting air samples to measure concentrations of elemental mercury in air released by solid media such as these suspected gym floorings. These methods are used to collect air samples to provide estimates for the amount of mercury that could be inhaled by a human over an 8-hour period.

<u>Below are the protocols for conducting the 8 hour indoor air monitoring</u>:

- In order to get a representative sample of the air that is inhaled by persons in the space during normal activities, samples shall be collected in the normal breathing zone (3 or 5 feet above the floor) and as near as possible to normal use activities. Please reference Section 3.0 for protocols.

- It is preferred that normal activities should be going on during the sampling event. Vendor should document if normal school activity is occurring and provide a summary of activities occurring in the gym on the data reporting table (Appendix B). Mercury is heavier than air and tends to lie along the surface of the flooring, so it is important for normal activities to be occurring and HVAC system(s) operating within normal occupancy settings in order to maintain as uniform mixing of air as possible. Under normal conditions, the indoor room temperature should range between 68 and 80^{o}F. In the event temperature readings are outside this range during testing, the Vendor shall confirm and document HVAC system(s) normal operating conditions [i.e. thermostat setting(s), ventilation rate, etc.] in addition to recording indoor room temperature values throughout the sampling period on the data reporting form (Appendix B).
- One sample shall be collected by an active calibrated airflow sampler equipped with an effective mercury trap using either a Jerome J505 or Lumex mercury vapor analyzer. Equipment shall be calibrated in accordance with manufacturer instructions. Calibration records shall be retained and submitted with the final report. However, additional air sampling points, up to approximately 3 locations, may be warranted based on the air sampling results and condition of the room. The sampling locations and number of meters will be determined by the task force and relayed to the Vendor prior to sampling. All sample locations shall be documented on the Sampling Location Map (see Appendix A) for future reference and possible retesting, and shall conform to the specifications previously mentioned in Section 3.0 of this document for spacing, recording, and submitting.
- The sampling event shall be prolonged. The sampling event shall extend through an entire work day schedule, beginning at the start of a work day and concluding at the end of the same work day, with an 8 hour minimum time period.
- The entire sampling process shall provide accurate and consistent sampling flow and timing to allow for accurate calculations of the average mercury in the air at the time of the sampling event.
- Document sampling results on the sample location plan and log into data logging table (Appendix B) and will be submitted electronically in the file provided. The provided electronic file is not to be modified by the Vendor.
- The Vendor shall provide an 8-hour sampling report submittal with the appropriate attached supporting documents to the SFB within 24 hours concluding the sampling event. In the event of detected elevated readings, the Vendor shall notify the SFB immediately. If the sampling event includes single sorbent tube sampling for QA/QC purposes (see below), the 8-hour sampling report submittal shall be provided to the SFB no later than 3 to 4 working days.
- SFB will contract to have an 8-hour sample randomly collected at 10 percent (%) of the facilities identified to have a suspect floor (Level C, per Appendix C).
- For QA/QC purposes, an air pump with a single sorbent tube will be collected at least 3 or 5 % (whichever is greater) of the entire 8-hour samples collected from Level C or D identified facilities.

The sorbent tube sample shall be collected adjacent to the mercury vapor analyzer sampler and for the equivalent time period. The sorbent tube shall be analyzed using OSHA Method ID-140 and submitted to an independent Arizona-certified laboratory with a turnaround time of 1 to 3 days. Sorbent tube samples shall follow sample collection/preservation protocols listed in SW-846 for analytical method 3050B/6020A. In addition, sorbent tube samples shall be documented on the 8-Hour Air Sample Sheet provided in Appendix B.

- ADEQ shall provide regulatory oversight on sampling events conducted randomly at 10 % of the facilities identified to have a suspect floor for QA/QC purposes (Level C, per Appendix C).

3.2 SEASONAL CHANGES

Sampling specifications listed in Section 3.0 were developed to ensure sampling is conducted at what is considered “normal operating conditions”, taking into account temperature and ventilation. By following the sampling plan, effects of seasonal changes will be minimal.

REFERENCES

Occupational Safety and Health Administration. 1987. Mercury Vapor In Workplace Atmospheres, OSHA Method ID-140, Revised June 1991.

United States Environmental Protection Agency (USEPA). 1996. “Method 3050B: Acid Digestion of Sediments, Sludges, and Soils,” Revision 2. December.

USEPA. 2014. “Method 6020B: Inductively Coupled Plasma—Mass Spectrometry,” Revision 2. July.

APPENDIX A

SAMPLE OF TYPICAL GYMNASIUM FLOOR LAYOUT - AIR OR BULK SAMPLING LOCATION MAP
ALL DATA MUST BE IN µg/m³ for Air Samples and Parts Per Million (ppm) for Total Mercury for bulk samples.

☐ 1	☐ 2	☐ 3	☐ 4	☐ 5
☐ 6	☐ 7	☐ 8	☐ 9	☐ 10
☐ 11	☐ 12	☐ 13	☐ 14	☐ 15
☐ 16	☐ 17	☐ 18	☐ 19	☐ 20
☐ 21	☐ 22	☐ 23	☐ 24	☐ 25

Please draw in any doorways, locker rooms or storage rooms, and/or exterior door that were included in the air sampling plan. Check the box in the grids used for sampling (air or bulk). Please show North with an arrow on drawing.

NAME OF SCHOOL_____**PROJECT NUMBER**_____

ADDRESS_____ **DATE OF SAMPLING EVENT**_____

CITY_____**, ARIZONA, ZIP CODE**_____

NOT TO SCALE

APPENDIX B – Summary Sheet
MERCURY SURVEY – DATA REPORTING TABLE

STATE OF ARIZONA

SCHOOL FACILITIES BOARD

Governor of Arizona
Douglas A. Ducey

Interim Executive Director
Philip G. Williams

MEMO

Rubber Flooring Testing Results / Actions Summary

School District Name	Completed by SFB	
School Name	before sending to vendor	
SFB Building ID / Use		
Test Date		
Outdoor Air Temperature		
Indoor Air Temperature		
Floor Surface Temperature	Self populating cells	
Bulk Sample Results – Mercury (PPM)		
Min. Mercury Vapor (µg/m3)		
Max. Mercury Vapor (µg/m^3)		
Outside Air Intake at Test – CFM / %		
Determined Level (A, B, C, D)	Completed by ADEQ / ADHS	
Restrictions for Floor / Space	before signing	
Actions for Floor		

Arizona Department of Environmental Quality	
Completed by ADEQ	
Signature	Date
Print Name	

Arizona Department of Health Services	
Completed by ADHS	
Signature	Date
Print Name	

APPENDIX B – Grab Air Sample Sheet
MERCURY SURVEY – DATA REPORTING TABLE

Sampling Location/ ID	Sampling Date	Sampling Time	Test (Indoor Air)				Outdoor Air		
			Hg vapor Concentration		Indoor Room Temp (°F)	Floor Temp (°F)	Hg vapor Concentration		Outside Temp (°F)
			Breathing Zone (3'-0" for Grades K-8, 5'-0" for Grades 9-12) AFF - Based on lowest grade	µg/m3			Breathing Zone (3'-0" for Grades K-8, 5'-0" for Grades 9-12) AFF - Based on lowest grade	µg/m3	
			Median		#NUM!	#NUM!			#NUM!

Red area to be completed by Testing Agency

APPENDIX B – 8-Hour Air Sample Sheet
MERCURY SURVEY – DATA REPORTING TABLE

Sampling Location/ ID	Sampling Date	Sampling Time	Indoor Air							
			Hg vapor Concentration		Indoor Room Temp (^{o}F)	Facility Normal Operating Condition (^{o}F)	Were there any activities conducted during sampling event? **YES or NO**	Summary of the activities conducted during the sampling event	Ventilation Rate	
			Breathing Zone (3'-0" for Grades K-8, 5'-0" for Grades 9-12) AFF - Based on lowest grade	µg/m^3					CFM	%
0			Median		#NUM!				#NUM!	#NUM!

Red area to be completed by Testing Agency

APPENDIX B – Bulk Sample Sheet
MERCURY SURVEY – DATA REPORTING TABLE

Sampling Location / ID	Sampling Date	Sampling Time	Size (g) of bulk sample	Concentration (PPM)
Maximums			0	0

Red area to be completed by Testing Agency

Appendix C
Sampling Decision Tree Based on Mercury Indoors and Bulk Sampling Results

The decision matrix is based on the premise that identified floors will be remediated at some point. Recommendations are based on the floor, temperature, and ventilation conditions taken at the time of sampling.