



Final Report Testing for Mercury

Conducted At:

Governor Charles C. Stratton School
15 Fredrick Blvd., Woolwich Township, NJ 08085

Walter Hill School
1815 E. Kings Highway, Swedesboro, NJ 08085

Conducted For:

Swedesboro-Woolwich School District
15 Fredrick Boulevard
Woolwich Township, NJ 08085

A handwritten signature in blue ink, appearing to read "Tom Pruno", is written over a horizontal line.

Tom Pruno
Director of Operations

Report Dated:
July 19, 2019





EXECUTIVE SUMMARY

Environmental Design Inc. prepared this final report on behalf of the Swedesboro-Woolwich School District, hereafter referred to as the Client, to document the results of the investigative sampling conducted at the Governor Charles C. Stratton School and the Walter Hill School in relation to potential mercury in the rubberized synthetic floors in the gymnasium at each school.

On April 26, 2019, *EDI* collected bulk samples of the rubberized synthetic flooring material in the gymnasium at each of the two schools. The analytical lab report for the bulk samples indicated there was mercury in the gym floors at both schools. Based on the bulk sample results and in accordance with New Jersey Department of Health guidelines, *EDI* recommended to the Client that air samples be collected at Stratton and Walter Hill to document the level of mercury vapor associated with the gym floors, if any.

On May 24, 2019, *EDI* collected air samples at Governor Charles C. Stratton School and Walter Hill School. The results of the air samples are summarized, as follows:

- Governor Charles C. Stratton School: Two air samples were collected in the gym and one air sample was collected in the hallway outside the gym. The analytical lab results for all three air samples were reported as either “None Detected” for mercury vapor, meaning no mercury vapor was detected in the air, or as being lower than the recommended maximum level of mercury vapor established by the New Jersey Department of Health to protect student health.
- Walter Hill School: Two air samples were collected in the gym and one air sample was collected in the hallway outside the gym. The analytical lab results for all three air samples were reported as either “None Detected” for mercury vapor, meaning no mercury vapor was detected in the air, or as being lower than the recommended maximum level of mercury vapor established by the New Jersey Department of Health to protect student health.

The New Jersey Department of Health (NJ DOH) recommends that mercury vapor levels be no more than 0.80 micrograms per cubic meter of air ($0.80 \mu\text{g}/\text{m}^3$) in order to protect student health; note that the recommended level is not zero. The highest level of mercury vapor detected at Stratton was $0.25 \mu\text{g}/\text{m}^3$ and the highest level of mercury vapor detected at Walter Hill was $0.50 \mu\text{g}/\text{m}^3$.

For teachers and other district employees, occupational exposures are governed by NJ Public Employees Occupational Safety & Health regulations. NJ PEOSH establishes a Permissible Exposure Limit (PEL) for mercury at 100 micrograms per cubic meter of air ($100 \mu\text{g}/\text{m}^3$). Compared to the PEL, the level of mercury vapor detected in the schools was several orders of magnitude lower than the PEOSH regulatory limit.

Based on all of the analytical laboratory results, and in consideration of the NJ DOH mercury-related guidance documents for the protection of student health and the NJ PEOSH occupational exposure limits for mercury, it is the professional opinion of *EDI* that the Governor Charles C. Stratton School gym and the Walter Hill School gym can continue to be utilized without the need for removal of the current floors, however, the Client is encouraged to follow the recommendations contained in this report regarding the on-going use of the gymnasiums at each school.



BACKGROUND & FINDINGS

New Jersey Department of Health (NJ DOH) guidance documents indicate rubberized synthetic floors manufactured up until the 1990's may contain organic mercury compounds. These mercury compounds were added to some types of rubberized synthetic flooring material either during the manufacturing process at the factory or during the installation process in the field. The primary health concern with mercury-containing floors is that the mercury compounds may volatilize (i.e. evaporate) into the air under certain conditions, releasing mercury vapor into the air. Exposure to mercury vapor can cause adverse health effects depending on exposure levels.

Media reports about mercury-containing floors at a local school district prompted the Swedesboro-Woolwich School District to evaluate the various types of flooring material throughout the district and to identify any suspect rubberized synthetic flooring material in the schools. Subsequently, the Client asked *EDI* to sample the rubberized synthetic gym floors at the Governor Charles C. Stratton School and the Walter Hill School as a precautionary measure. There were no other suspect mercury-containing floors identified in the district, according to the Client.

On April 26, 2019, *EDI* collected bulk samples of the rubberized synthetic flooring material in the gymnasiums at the Governor Charles C. Stratton School and the Walter Hill School. Two bulk samples were collected at Stratton, but only one bulk sample was collected at Walter Hill due to concerns about damaging the existing the floor. The physical samples were analyzed for mercury content by a certified, third-party laboratory, EMSL Analytical, Inc., per EPA Method 7471B, which is the current EPA analytical method for determining mercury content in synthetic flooring materials.

The analytical lab report for the bulk samples collected at both schools indicated there was mercury present in each of the gym floors above one part per million (1 ppm). The bulk sample data is summarized in Table 1, below:

Table 1. Results Summary - Mercury Bulk Sampling

School	Sample	Result	Average
Governor Charles C. Stratton School	#1	210 ppm	260 ppm
	#2	310 ppm	
Walter Hill School	#1	160 ppm	160 ppm

Based on the results of the bulk sample analysis and in accordance with NJ DOH guidelines, *EDI* recommended to the Client that air samples be collected at both schools to determine if any mercury vapor was present and if so, at what level. According to NJ DOH, not all mercury-containing floors emit mercury vapor.



On May 24, 2019, EDI collected air samples at the Governor Charles C. Stratton School and Walter Hill School. There were three samples collected at each school: two samples were collected in the gym and one sample was collected in a hallway location outside of the gym. The air samples were collected either at 3 feet or 5 feet above the floor, approximately. The HVAC system in each gymnasium was set to “occupied” mode for the duration of the sampling event. The sampling protocol conformed to the NIOSH 6009 Method, which employs a glass sorbent tube attached to a portable sampling pump calibrated to run at 0.2 liters per minute. Each sample was allowed to run for eight hours for a total air volume of 96 liters. The sorbent tubes were delivered to a certified, third-party laboratory, EMSL Analytical, Inc., for analysis.

The analytical lab report for the air samples collected at the Stratton School indicated there was a low level of mercury vapor present. The results for the two samples collected at Stratton were reported as 0.16 micrograms of mercury per cubic meter of air ($0.16 \mu\text{g}/\text{m}^3$) and $0.25 \mu\text{g}/\text{m}^3$, respectively. The third sample was reported as None Detected. According to the NJ DOH, a mercury vapor level less than $0.80 \mu\text{g}/\text{m}^3$ is considered acceptable for school environments and protective of the health of preschool-aged children. Note that the level of mercury detected in the Stratton School is several times lower than the NJ DOH recommended maximum level.

The analytical lab report for the air samples collected at the Walter Hill School indicated there was a low level of mercury vapor present. The results for two samples collected at Stratton were reported as 0.18 micrograms of mercury per cubic meter of air ($0.18 \mu\text{g}/\text{m}^3$) and $0.50 \mu\text{g}/\text{m}^3$, respectively. The sample collected in the hallway was reported as None Detected. According to the NJ DOH, a mercury vapor level less than $0.80 \mu\text{g}/\text{m}^3$ is considered acceptable for school environments and protective of the health of preschool-aged children. Note that the level of mercury detected in the Walter Hill School is several times lower than the NJ DOH recommended maximum level.

The air sample data is summarized in Table 2, below:

Table 2. Results Summary - Mercury in Air Sampling

School	Sample	Result	Average
Governor Charles C. Stratton School	Gym #1	$0.16 \mu\text{g}/\text{m}^3$	$0.21 \mu\text{g}/\text{m}^3$
	Gym #2	None Detected	
	Hall	$0.25 \mu\text{g}/\text{m}^3$	
Walter Hill School	Gym #1	$0.50 \mu\text{g}/\text{m}^3$	$0.34 \mu\text{g}/\text{m}^3$
	Gym #2	$0.18 \mu\text{g}/\text{m}^3$	
	Hall	None Detected	

It is important to understand that the NJ DOH recommended maximum level for mercury vapor exposure is a risk-based Maximum Contaminant Level (MCL) value. Understanding how the MCL value was derived and what it actually represents helps put the mercury vapor concentrations detected into perspective, and it also serves to explain why the gyms are considered acceptable for occupancy without the need for remedial actions.

The MCL is derived from a calculation which uses conservative exposure variables to establish health risks. The MCL for mercury vapor factors a child’s exposure at 8-hours per day for 180 days per year. According to the NJ DOH, a child’s health is still protected if they are exposed to $0.80 \mu\text{g}/\text{m}^3$ of mercury



vapor for 8-hours per day (which is longer than the typical school day) for 180 days per year (which is every day of the typical school year). In reality, however, students do not stay in the gym for 8-hours per day and they may not even participate in activities in the gym every day of the school year. Thus, the MCL value essentially represents a “worst-case scenario” condition that for all practical purposes will never be experienced by students since they are unlikely to ever have 180 days of exposure let alone 8-hours per day of exposure. Consequently, the health risks associated with the low mercury vapor levels in the school are significantly lower than the potential health risks associated with exposures at NJ DOH MCL level.

Occupational exposures for teachers and other district employees are governed by NJ PEOSH regulations, which establish a statutory Permissible Exposure Limit (PEL) for occupational exposure to mercury vapor at 100 micrograms per cubic meter of air ($100 \mu\text{g}/\text{m}^3$). Similar to the NJ DOH MCL value, the NJ PEOSH PEL is a calculated value that reflects a “safe” level of exposure. The PEL is based on a daily 8-hour time-weighted average factored over a 40-hour work week for a working lifetime. The time-weighted average calculation allows for occupational exposures in excess of the $100 \mu\text{g}/\text{m}^3$ provided the overall daily exposure (averaged over 8 hours) does not exceed the $100 \mu\text{g}/\text{m}^3$ limit.

Understanding the NJ PEOSH PEL helps put the mercury vapor concentrations detected at each school into perspective, and it also serves to explain why the gyms are considered acceptable for occupancy without the need for remedial actions. Because the levels of airborne mercury detected in the gym at each school were several orders of magnitude lower than the PEL, and because staff are unlikely to have a full 8-hour exposure, the potential health risks associated with the low mercury vapor levels in the school are exponentially lower than the potential health risks associated with exposures at the PEL.



CONCLUSIONS/RECOMMENDATIONS

In consideration of the NJ Department of Health recommended maximum level for mercury exposure and the NJ PEOSH Permissible Exposure Limit for occupational exposure to mercury, and based on the analytical laboratory results obtained at each school, it is the professional opinion of *Environmental Design Inc.* that the Governor Charles C. Stratton School and Walter Hill School gymnasiums can continue to be occupied and utilized by students and staff, however, *EDI* encourages the Client to consider the following recommendations:

- The HVAC system in the gym should be operated in "occupied" mode even when the gym is vacant, including nights, weekends, and holidays. It is important to supply fresh make-up air and to provide sufficient of air changes per hour to prevent mercury vapor from accumulating in the gym.
- The rate at which mercury vapor is released from a floor tends to increase with temperature. According to an unpublished study by the Minnesota Department of Health, the rate at which mercury is emitted from a floor doubles with approximately every 9°F increase in floor temperature. Industry guideline suggest that keeping the temperature in the gym around 68°F is an ideal year-round target. The lower temperature may increase the chance of condensation forming in the gym, which could lead to mold growth, therefore extra vigilance may be needed to monitor for signs of condensation and mold in the gym.
- Maintaining the condition of the gym floor is important in controlling the level of mercury vapor in the air. A damaged floor may release more mercury vapor than a tight, well-kept floor. However, the Client should not encapsulate or cover the floor.
- Teachers, staff, custodial, and maintenance personnel should be informed of the nature of the mercury hazards associated with the gym floor.
- *EDI* recommends the Client implement a proactive, periodic air monitoring program at both schools to measure the mercury vapor levels at selected intervals throughout the year (i.e. quarterly or semi-annually).

EDI is not recommending the removal of the mercury-containing floors at either school. If the Client decides to embark on a floor removal project, then the Client should conduct core sampling of the concrete slab and underlying soil to determine the extent of mercury contamination. It is possible that portions of, or even the entire concrete slab may need to be excavated. At a minimum, the top layer of the concrete slab will need to be scarified. If there are cracks in the slab, then the likelihood of deeper contamination is increased, dictating a more complicated, time-consuming, and costly project. In addition to the direct costs for removal and disposal of a mercury-containing floor, the Client will need to factor the cost of a replacement floor and the ancillary engineering, architectural, and environmental services required for the project.

EDI

LAB REPORTS

**EMSL Analytical, Inc.**

200 Route 130 North, Cinnaminson, NJ 08077

Phone/Fax: (856) 303-2500 / (856) 858-4571

<http://www.EMSL.com>EnvChemistry2@emsl.com

EMSL Order: 011904865

CustomerID: EDI50

CustomerPO:

ProjectID:

Attn: **Tom Pruno**
Environmental Design, Inc.
5434 King Avenue
Suite 101
Pennsauken, NJ 08109

Phone: (856) 616-9516
 Fax: (586) 616-9517
 Received: 04/26/19 1:15 PM

Project: **Swedesboro/Woolwich School District****Analytical Results**

Client Sample Description 30-0426-01 **Collected:** 4/26/2019 **Lab ID:** 011904865-0001
 Gym floor 10:35:00 AM

Method	Parameter	Result	RL	Units	Prep Date	Analyst	Analysis Date	Analyst
METALS								
7471B	Mercury	210		11 mg/Kg	5/2/2019	PV	5/3/2019	PV

Client Sample Description 30-0426-02 **Collected:** 4/26/2019 **Lab ID:** 011904865-0002
 Gym floor 10:55:00 AM

Method	Parameter	Result	RL	Units	Prep Date	Analyst	Analysis Date	Analyst
METALS								
7471B	Mercury	310		23 mg/Kg	5/2/2019	PV	5/3/2019	PV

Client Sample Description 30-0426-03 **Collected:** 4/26/2019 **Lab ID:** 011904865-0003
 Gym floor 11:25:00 AM

Method	Parameter	Result	RL	Units	Prep Date	Analyst	Analysis Date	Analyst
METALS								
7471B	Mercury	180		9.2 mg/Kg	5/2/2019	PV	5/3/2019	PV

Definitions:

MDL - method detection limit

J - Result was below the reporting limit, but at or above the MDL

ND - indicates that the analyte was not detected at the reporting limit

RL - Reporting Limit (Analytical)

D - Dilution

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EMSL Order: 011906464

CustomerID: EDI50

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Attn: **Tom Pruno**
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5434 King Avenue
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Phone: (856) 616-9516
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 Received: 05/28/19 9:00 AM

Project: **Swedesboro-Woolwich BOE****Analytical Results**

Client Sample Description GCS-01
Gy-caf side **Collected:** 5/24/2019 **Lab ID:** 011906464-0001

Method	Parameter	Result	RL	Units	Prep Date & Analyst	Analysis Date & Analyst
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METALS

NIOSH 6009	Mercury	0.00016		0.00010 mg/m ³	5/30/2019 PV	5/30/2019 PV
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Client Sample Description GCS-02
Gym-stage side **Collected:** 5/24/2019 **Lab ID:** 011906464-0002

Method	Parameter	Result	RL	Units	Prep Date & Analyst	Analysis Date & Analyst
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METALS

NIOSH 6009	Mercury	ND		0.00010 mg/m ³	5/30/2019 PV	5/30/2019 PV
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Client Sample Description GCS-03
Hall-outside gym **Collected:** 5/24/2019 **Lab ID:** 011906464-0003

Method	Parameter	Result	RL	Units	Prep Date & Analyst	Analysis Date & Analyst
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METALS

NIOSH 6009	Mercury	0.00025		0.00010 mg/m ³	5/30/2019 PV	5/30/2019 PV
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Client Sample Description WH-01
Gym-caf side **Collected:** 5/24/2019 **Lab ID:** 011906464-0004

Method	Parameter	Result	RL	Units	Prep Date & Analyst	Analysis Date & Analyst
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METALS

NIOSH 6009	Mercury	0.00050		0.00010 mg/m ³	5/30/2019 PV	5/30/2019 PV
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Client Sample Description WH-02
Gym-stage side **Collected:** 5/24/2019 **Lab ID:** 011906464-0005

Method	Parameter	Result	RL	Units	Prep Date & Analyst	Analysis Date & Analyst
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METALS

NIOSH 6009	Mercury	0.00018		0.00010 mg/m ³	5/30/2019 PV	5/30/2019 PV
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Client Sample Description WH-03
Hall-outside gym **Collected:** 5/24/2019 **Lab ID:** 011906464-0006

Method	Parameter	Result	RL	Units	Prep Date & Analyst	Analysis Date & Analyst
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METALS

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Suite 101
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Phone: (856) 616-9516
 Fax: (586) 616-9517
 Received: 05/28/19 9:00 AM

Project: **Swedesboro-Woolwich BOE****Analytical Results**

Client Sample Description WH-03
Hall-outside gym
Collected: 5/24/2019
Lab ID: 011906464-0006

Method	Parameter	Result	RL	Units	Prep Date & Analyst	Analysis Date & Analyst
METALS						
NIOSH 6009	Mercury	ND		0.00010 mg/m ³	5/30/2019 PV	5/30/2019 PV

Client Sample Description Blank-01
Blank 01
Collected: 5/24/2019
Lab ID: 011906464-0007

Method	Parameter	Result	RL	Units	Prep Date & Analyst	Analysis Date & Analyst
METALS						
NIOSH 6009	Mercury	ND		0.000010 mg/tube	5/30/2019 PV	5/30/2019 PV

Client Sample Description Blank-02
Blank
Collected: 5/24/2019
Lab ID: 011906464-0008

Method	Parameter	Result	RL	Units	Prep Date & Analyst	Analysis Date & Analyst
METALS						
NIOSH 6009	Mercury	ND		0.000010 mg/tube	5/30/2019 PV	5/30/2019 PV

Definitions:

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RL - Reporting Limit (Analytical)

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LIMITATIONS AND SERVICE CONSTRAINTS

Environmental Design Inc. (EDI) has presented professional opinions in this report based on information provided to us by the Client and gathered by *EDI* personnel on site. Conditions described in this report are as found at the time of the investigation, unless stated otherwise. The Client selected the date and time of our evaluation.

Sample results represent a snapshot of environmental conditions at a specific time. Indoor and outdoor environmental conditions can change daily, weekly, monthly, and even throughout the day. *EDI* has done nothing to create or contribute to the presence of any hazardous waste, pollutants, chemicals, or other hazardous materials at the Client's property. A full and complete determination as to whether a certain property is or is not free from environmental hazards cannot be made with 100% certainty.

The Client retained *EDI* for the sole purpose of assisting them in evaluating indoor mercury levels in the gym. *EDI* is only responsible for the limited evaluation of specific areas of the school that the Client requested *EDI* to assess, and only for the specific samples collected.

The evaluation conducted by *EDI* was non-destructive (i.e. walls were not broken open, drop ceilings were not removed, etc.). *EDI* did not evaluate nor are we qualified to assess the operational effectiveness of the mechanical systems providing heating and air conditioning. Mechanical systems that are not operating properly or that do not adequately provide sufficient fresh air or air exchanges can be a significant contributing factor in any indoor quality problem.

The tests *EDI* conducted were based on the problem described by the Client and site conditions at the time of our evaluation. These tests may not be the only testing methodologies available for this type of evaluation. Further, the test results represent a "snap shot in time" of the conditions at the site and are reflective of the conditions at the time of the evaluation only. *EDI* receives no remuneration for any products suggested for use in cleaning or remediation.

EDI will not be held liable for any disclosures, notifications, or reports that may be required to be made to third parties, including the governmental agencies.

EDI

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