FACT SHEET

CITY OF NEW BEDFORD'S ENVIRONMENTAL INVESTIGATION OF THE NEW BEDFORD HIGH SCHOOL UNIVENT DUST ISSUE

City of New Bedford/TRC, January 2012

Recently, white dust has been observed near certain unit ventilators (univents) in some B-Block classrooms at New Bedford High School. This fact sheet summarizes what is known so far concerning this dust.

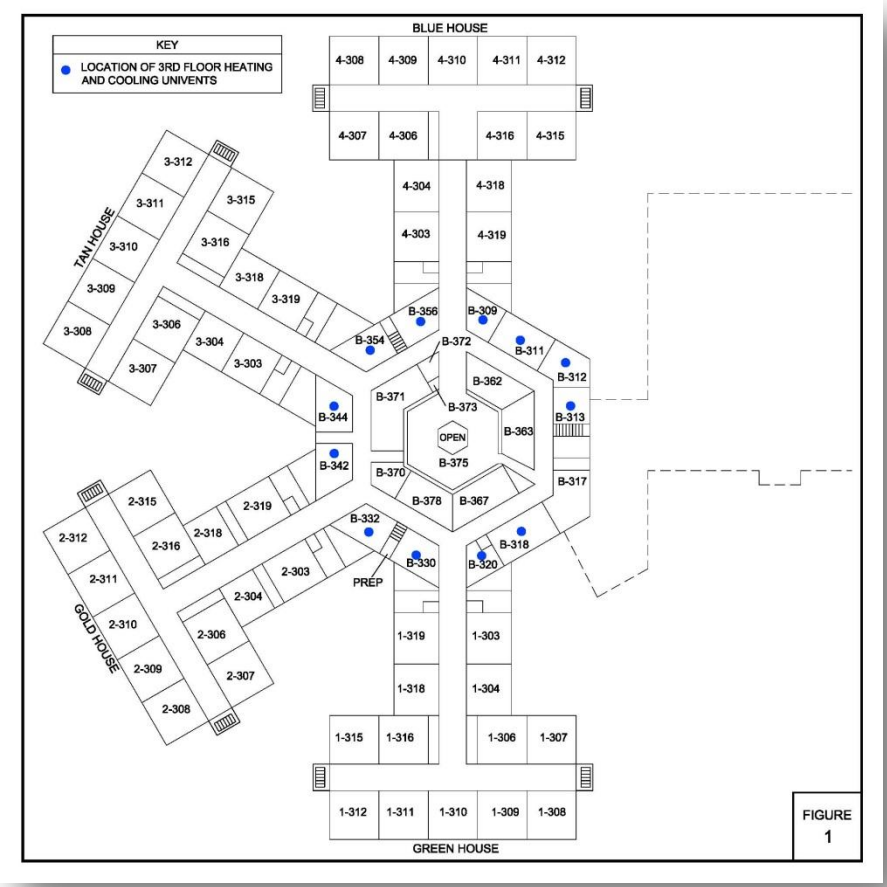
A sample of the white dust was submitted to a laboratory. The laboratory identified the dust as mostly **aluminum oxide,** using microscopic testing. Additional details concerning the testing performed and the results are provided later in this Fact Sheet. Terms in bold are defined in the Glossary of Terms at the end of the Fact Sheet.

Aluminum metal that is exposed to moisture and air will develop a thin coating of material, such as **aluminum oxide,** at its surface. The production of **aluminum oxide** is similar to the more familiar situation where iron in the presence of moisture and air will produce rust. This thin coating, or oxide layer on the aluminum, is soft and can produce a dust if disturbed. The dust has been observed with some of the univents in B-Block. These univents were installed in the summer of 2010 to replace old units that contained an internal coating with polychlorinated biphenyls (PCBs) and improve ventilation. These univents have aluminum metal strips, called fins, to transfer heat or cold from the water circulating in the univents to the air in the room. Each unit also has a fan to move the warmed or cooled air from the fins into the room. Although some formation of **aluminum oxide** is expected over time, a few of the univents inspected had some oxide buildup on the fins. This oxide buildup on the univent fins and its disturbance by the univent fan appears to be the cause of the white dust noticed in the classrooms.

Aluminum oxide is not a health hazard.

Aluminum oxide is a typical component of indoor dust when aluminum metal is present. Unfortunately, there are no indoor air standards or guidelines for aluminum oxide for school buildings or residences. However, the current occupational standard established by the American Conference of Governmental Industrial Hygienists for an 8-hour work day (called a **Threshold Limit Value or TLV)** is 1 milligram of **aluminum oxide** dust per cubic meter (mg/m^3) of air. This amount of **aluminum oxide** in air would cause a visible dust cloud, as opposed to the intermittent bursts of a smaller number of particles observed in the classrooms. The **aluminum oxide** dust is made of large particles that quickly settle onto nearby surfaces rather than staying in the air where they could be inhaled. **Aluminum oxide** dust is considered primarily a nuisance and does not pose a health threat.

Figure 1 shows the location of the rooms where the **aluminum oxide** dust has been observed on the outside of the univent and on other surfaces in the room.



Evaluation of Cause

The change of a metal to a metal oxide, in this case aluminum metal to **aluminum oxide,** occurs when a metal is exposed to moisture and air. This process occurs more rapidly if there is **galvanic corrosion** occurring between two different metals. **Galvanic corrosion** is a process that occurs when one metal corrodes preferentially when both metals are in electrical contact. The damaged metal is converted into its oxide form. We are presently evaluating if the affected univents may have **galvanic corrosion** occurring between the aluminum fins and copper coils that is creating the **aluminum oxide** dust, as well as other potential causes (e.g., moisture buildup). The investigative team includes a Certified Industrial Hygienist (CIH) with experience in indoor air quality, building ventilation and forensic investigations; a mechanical engineering ventilation specialist; School Department staff (engineering, custodial, and maintenance staff); and a technical representative from the univent manufacturer. This team is tasked with determining why the oxide is forming at a faster rate in some of the units.

Steps Taken and Related Findings

The dust was sampled and analyzed using several microscopic techniques and x-ray diffraction. These procedures identified the type of dust particles present in the sample as well as its composition. The analysis showed that 85-percent of the dust sample was **aluminum oxide** and 5-percent iron oxide (rust), with the remaining 10-percent identified as other constituents that are typically found in dust. The univents were also inspected and units with white dust were identified. The univents will be checked by an electrician for proper grounding, followed by the removal of select components for a

detailed inspection and evaluation. In the interim, the School Department will install a filter fabric to intercept nuisance dust until the cause of the dust production is identified and corrected.

Microscopic Analysis Details

The laboratory data report (attached) was obtained using the following equipment and methods:

- Polarized Light Microscopy (PLM)
- epi-Reflected Light Microscopy (RLM)
- Stereo Microscopy
- Scanning Electron Microscopy (SEM)
- Energy-dispersive X-Ray Spectrometry (EDX)

The analysis was performed by a nationally-recognized laboratory specializing in industrial hygiene and indoor air analysis (EMSL Analytical, Incorporated of Cinnaminson, New Jersey).

The Next Steps

The City will continue to investigate the source of the **aluminum oxide** dust and work with the school and installer to correct problems with the univents. Some of the univents have been shut down until the problem is corrected. Although the dust is a nuisance, it is not a health hazard and can be cleaned with normal cleaning procedures.

For More Information

If you have additional questions, please contact Cheryl Henlin, City of New Bedford Environmental Stewardship Department, at (508) 991-6188 or email cheryl.henlin@newbedford-ma.gov.

GLOSSARY OF TERMS

Aluminum oxide – A chemical that occurs naturally in the environment when aluminum metal is exposed to air and moisture. It is used as an abrasive (such as in woodworker's sand paper) and is used as an inert filler in many materials.

Galvanic corrosion – A chemical process in which one metal corrodes preferentially when both metals are in electrical contact and also in contact with an electrolyte solution such as salt water. The same galvanic reaction is used in batteries to generate electricity.

Threshold Limit Value (TLV) – Recommended workplace exposure guidelines that are based on health effects data collected by the American Conference of Governmental Industrial Hygienists**.** TLVs are air concentrations that workers can be exposed to without adverse health effects**.**

EMSL Analytical, Inc.

200 Route 130 North, Cinnaminson, NJ 08077
Phone: (856) 858-4800

Attn.: *Dave Sullivan*
TRC Environmental
650 Suffolk St.
Lowell, MA 01854

Phone: 978-656-3565

EMSL Case No.: 361200061
Sample(s) Received: 1/07/2012
Date of Analysis: 1/11/2012
Date Printed: 1/11/2012
Reported By: M. Johnson
Email: dsullivan@trcsolutions.com

- Laboratory Report -

Full Particle Identification

Project: NBHS/115058.820.3

Conclusions:

- Sample "NBHS-UV-1" is composed primarily of aluminum oxide. Rust (iron oxides), paper pulp, quartz, and calcite/ dolomite were identified as minor components.

Procurement of Samples and Analytical Overview:

The material for analysis (one bulk sample) arrived at EMSL Analytical (Cinnaminson, NJ) on January 7, 2012. The package arrived in satisfactory condition with no evidence of damage to the contents. The purpose of the analysis is to determine the identification of the individual components. The data reported herein has been obtained using the following equipment and methodologies.

Methods & Equipment:
Polarized Light Microscopy (PLM)
epi-Reflected Light Microscopy (RLM)
Stereo Microscopy
Scanning Electron Microscopy (SEM)
Energy-dispersive X-Ray Spectrometry (EDX)

Analyzed by: *Melanie Johnson* — 1/11/2012
Melanie Johnson
Materials Analyst
Date

Reviewed/Approved: *Dana D'Ulisse* — *Eugenia Mirica* — 1/11/2012
Dana D'Ulisse
Approved Signatory
Eugenia Mirica, Ph.D.
Laboratory Manager
Date

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Sample #:	NBHS-UV-1		*Description:*	Particulate From Unit Ventilator	
Nuisance Particulate:		(%)	Biological Particulate:		(%)
Asbestos:	(Total)	ND	Mold:	(Total)	ND
MMVF's:	Fibrous Glass	<1	Pollen:	(Total)	ND
	Mineral Wool	ND	Diatoms:	(Total)	ND
	Ceramic Fibers	ND	Insect Fragments:	(Total)	ND
Glass:	Fragments	<1			

Common Particulate:		(%)			(%)
Cellulosic:	Processed	ND		Rust (Iron Oxides)	5
	Natural	<1		Aluminum Oxide	85
	Wood	<1		Zinc Oxide	ND
	Paper Pulp	1		Paint Dust	ND
	Starch	ND		Quartz	1
				Calcite/ Dolomite	1
Synthetic:	(Total)	ND		Gypsum/ Anhydrite	<1
				Clay/ Feldspars	ND
	Human Hair	ND		Plaster	ND
	Animal Hair	ND		Cement	ND
	Skin Fragments	ND			
Unidentified:	Inert Organics	1	Unidentified:	Inorganics	1

Additional Particulate:
None

LOD ~1%

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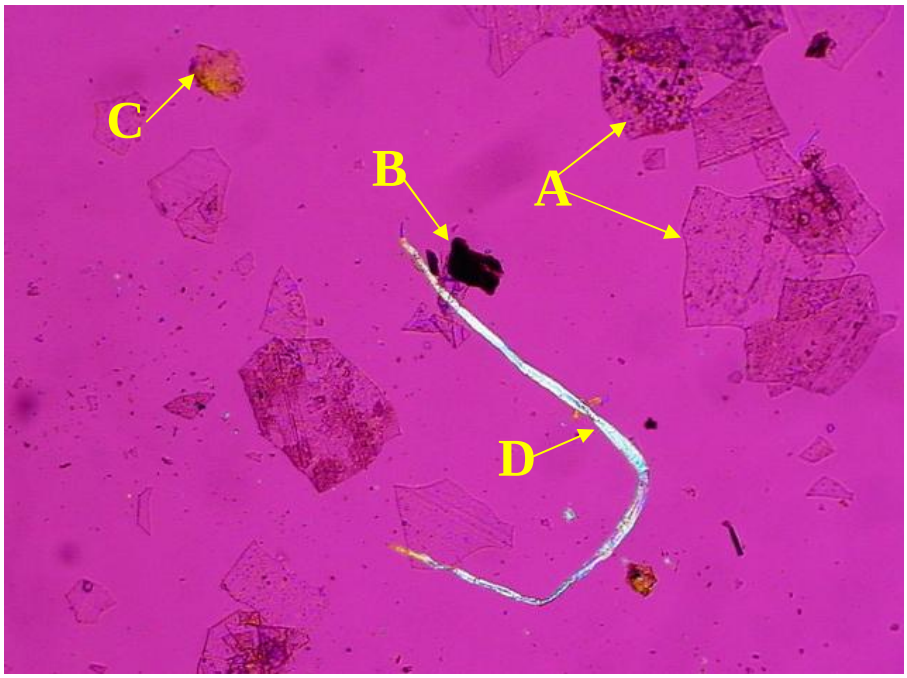

Figure 1: PLM image of the material in sample "NBHS-UV-1"
A: Aluminum Oxide
B: Rust (Iron Oxides)
C: Quartz
D: Paper Pulp

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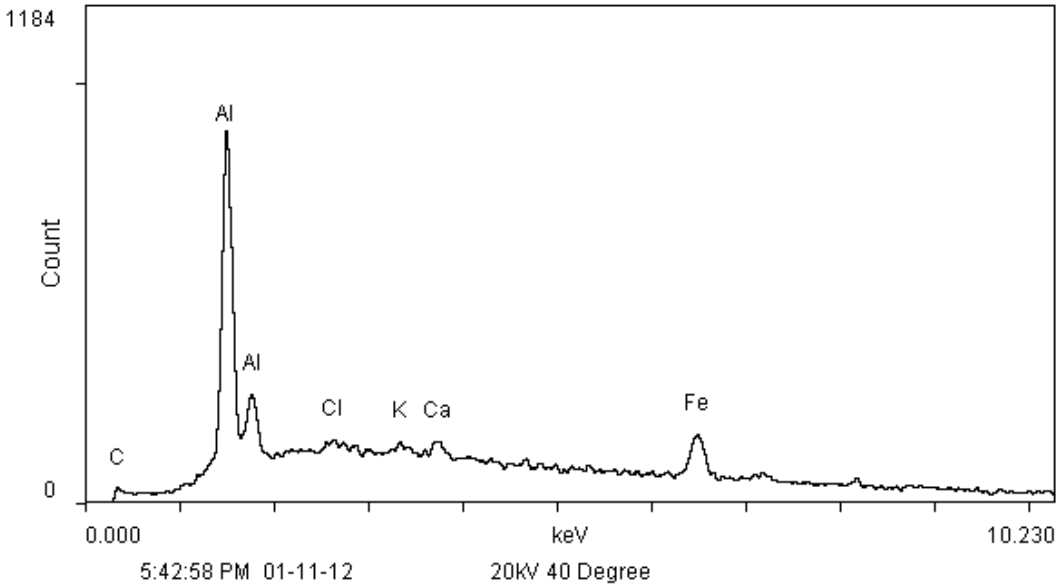

Figure 2: SEM/ EDX elemental spectrum of sample "NBHS-UV-1" indicating the presence of aluminum (Al) oxide, rust (iron (Fe) oxides), calcite/ dolomite ($CaCO_3$/ $CaMg(CO_3)_2$), and organic/carbon (C) based particulate (cellulose, etc.). The sample was coated with gold (Au) prior to analysis to minimize electron charging.

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Descriptions & Definitions:

None Detected (ND) denotes the absence of analyte in the subsample analyzed. Trace levels of the analyte may be present in the sample below the limit of detection (LOD).

Limit of Detection (LOD): The minimum concentration that can be theoretically achieved for a given analytical procedure in the absence of matrix or sample processing effects. Particle analysis is limited to a single occurrence of an analyte particle in the sub-sample analyzed.

Limit of Quantitation (LOQ): The minimum concentration of an analyte that can be measured within specified limits of precision and accuracy during routine laboratory operating conditions

Concentrations for bulk samples are derived from Visual Area Estimation (VAE) unless otherwise noted. Air sample concentrations are calculated to particles per unit volume.

VAE technique estimates the relative projected area of a certain type of particulate from a mixture of particulate by comparison to data derived from analysis of calibration materials having similar texture and particulate content. Due to bi-dimensional nature of the measurements, in some cases the particle thickness could affect the results.

Important Terms, Conditions, and Limitations:

Sample Retention: Samples analyzed by EMSL will be retained for 60 days after analysis date. Storage beyond this period is available for a fee with written request prior to the initial 30 day period. Samples containing hazardous/toxic substances which require special handling may be returned to the client immediately. EMSL reserves the right to charge a sample disposal or return shipping fee.

Change Orders and Cancellation: All changes in the scope of work or turnaround time requested by the client after sample acceptance must be made in writing and confirmed in writing by EMSL. If requested changes result in a change in cost the client must accept payment responsibility. In the event work is cancelled by a client, EMSL will complete work in progress and invoice for work completed to the point of cancellation notice. EMSL is not responsible for holding times that are exceeded due to such changes.

Warranty: EMSL warrants to its clients that all services provided hereunder shall be performed in accordance with established and recognized analytical testing procedures and with reasonable care in accordance with applicable federal, state and local laws. The foregoing express warranty is exclusive and is given in lieu of all other warranties, expressed or implied. EMSL disclaims any other warranties, express or implied, including a warranty of fitness for particular purpose and warranty of merchantability.

Limits of Liability: In no event shall EMSL be liable for indirect, special, consequential, or incidental damages, including, but not limited to, damages for loss of profit or goodwill regardless of the negligence (either sole or concurrent) of EMSL and whether EMSL has been informed of the possibility of such damages, arising out of or in connection with EMSL's services thereunder or the delivery, use, reliance upon or interpretation of test results by client or any third party. We accept no legal responsibility for the purposes for which the client uses the test results. EMSL will not be held responsible for the improper selection of sampling devices even if we supply the device to the user. The user of the sampling device has the sole responsibility to select the proper sampler and sampling conditions to insure that a valid sample is taken for analysis. Any resampling performed will be at the sole discretion of EMSL, the cost of which shall be limited to the reasonable value of the original sample delivery group (SDG) samples. In no event shall EMSL be liable to a client or any third party, whether based upon theories of tort, contract or any other legal or equitable theory, in excess of the amount paid to EMSL by client thereunder.

The data and other information contained in this report, as well as any accompanying documents, represent only the samples analyzed. They are reported upon the condition that they are not to be reproduced wholly or in part for advertising or other purposes without the written approval from the laboratory.