Report
For
Indoor Air Quality Study
At
Wood End School
Reading, MA

Project Date:
October 26, 2004

STUDY CONDUCTED BY:

UNIVERSAL ENVIRONMENTAL CONSULTANTS
1151 Worcester Road
Framingham, Massachusetts

UEC

October 28, 2004

Mr. John Thiffault, Director of Facilities
Reading Public Schools
62 Oakland Street
Reading, MA 01867

Reference: **Indoor Air Quality Study (IAQS)**
Reading Wood End School

Dear Mr. Thiffault:

Thank you for the opportunity for Universal Environmental Consultants (UEC) to provide professional services.

Enclosed please find the report for Indoor Air Quality Study at the Wood End School conducted on Tuesday, October 26, 2004.

Please do not hesitate to call should you have any questions.

Very truly yours,

Universal Environmental Consultants

Ammar M. Dieb
President

UEC\24129IAQreport1028.Doc

Enclosure

Universal Environmental Consultants
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Framingham, MA 01701
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1.0 Scope:

It was requested that an Indoor Air Quality testing be performed at the Wood End School.

Testing was performed on October 26, 2004 On October 26, at 3:00 PM the outdoor temperature was 52 degrees F, under mostly sunny skies. The dew point was 40 degrees F and the barometric pressure was 30.08 inches of mercury. Relative humidity was 64%. The building was unoccupied at the time of testing with students being dismissed at 12:15 PM. Some teachers and staff were still in the building at the time of testing. Some windows were opened upon arrival but closed thereafter. The windows and doors remained closed during the testing period.

2.0 Methodology:

Testing for Total Volatile Organic Compounds (*TVOCs*) was performed by Rae Systems "PPB Rae" Photo-Ionization Detector (PID) with an 11.7v lamp. This is a state of the art instrument for detecting total *VOCs* in the parts per billion range. The instrument is a direct read and therefore capable of providing continuous results over an extended time and area.

VOCs are a broad class of chemicals with diverse applications. *VOCs* are frequently emitted by new carpets and furniture, pressboard, varnishes, adhesives and high gloss finishes. Other common household products include: paints, paint strippers, and other solvents; wood preservatives; aerosol sprays; cleansers and disinfectants; moth repellents and air freshener; stored fuels and automotive products; hobby supplies and dry-cleaned clothing. High levels of *VOCs* is a common Indoor Air Quality problem, especially in newly constructed or renovated buildings

Carbon monoxide (*CO*) was measured by direct read ToxiRAE Toxic Gas Monitor (PGM-35).

Carbon Dioxide (CO_2) was measured by means of a direct read, Bacharach detector utilizing IR Technology. The instrument was calibrated on site prior to testing.

Temperature, relative humidity, light intensity and diffuser velocity were collected by Sper Scientifics Model 850070 instrument. RH was confirmed by sling psychrometer.

Airborne particulates were tested by MIE Corp.'s PDR-1000, Direct Read instrument. The instrument was calibrated immediately prior to testing. The machine is serviced annually by an independent vendor who is certified for maintenance and repairs by the manufacturer.

Temperature, diffuser velocity, light intensity, and relative humidity were collected by Sper Scientifics Model 850070 Instrument.

3.0 Results:

TOTAL VOLATILE ORGANICS (PID), CO, CO_2
TOTAL AIRBORNE PARTICULATES

Location	TVOCs (PPB)	Noise (dB)	Carbon Monoxide (PPM)	Carbon Dioxide (PPM)	Particulates (Mg/M^3)	Light (Lux)
Media Center	28	53	ND	400	0.010	330
Cafeteria	70	47	ND	400	0.011	NC
Kitchen	65	46	ND	400	0.012	NC
Gymnasium	27	59	ND	350	0.012	NC
Rear Stairwell by Gymnasium	960	NC	ND	400	0.010	NC
Classroom 216	40	47	ND	400	0.010	507
Classroom 215	37	50	ND	400	0.012	680
Classroom 206	26	51	ND	400	0.009	518
Classroom 202	30	58	ND	400	0.014	540
Classroom 203	30	53	ND	400	0.012	460
Second Floor Atrium	41	NC	ND	400	0.010	NC
Classroom 209	25	51	ND	400	0.011	505
Classroom 213	<20	52	ND	400	0.012	530
Classroom 210	26	50	ND	350	0.012	480
Classroom 103	26	51	ND	400	0.010	860
Classroom 101	37	52	ND	400	0.010	784
Classroom 105	28	56	ND	400	0.012	761
Classroom 109	28	52	ND	400	0.009	418
Stairwell by Classroom 111	68	NC	ND	400	0.014	NC
First Floor Restrooms	41	NC	ND	400	0.012	NC
Main Office	105	47	ND	400	0.013	280
Mechanical Room	41	59	ND	400	0.015	NC
Outside	<20	49	ND	400	0.004	NA

TEMPERATURE & RELATIVE HUMIDITY

Location	Temperature (F)	% RH
Media Center	70.1	39.1
Cafeteria	71.3	38.4
Second Floor Classroom 214	70.5	38.8
Outside	52	63

Legend:
CO - OSHA PEL is 30 PPM, ACGIH TLV is 25 PPM;
CO_2 - OSHA PEL is 5000 PPM, Mass DOH Guideline is 800 PPM
TVOC - See Comments/Observations
Particulates - OSHA PEL is 15 mg/M^3, ACGIH TLV is 3 mg/M^3
NC - Not Collected

4.0 Interpretation of Results:

Temperature and relative humidity were within the winter range in all areas tested when compared with American Society of Heating, Refrigeration and Air-conditioning Engineers' ANSI/ASHRAE 55-1992 "Thermal Environmental Conditions for Human Occupancy."

Total airborne particulates were well below the OSHA limit of 15 mg/M³ and the ACGIH guideline of 3 mg/M³. Yet, the foregoing guidelines are more applicable to industrial settings and therefore have limited value in accessing office, hospital and school type environments. In those few jurisdictions, which have particulate guidelines for schools, they are generally in the 0.050-to 0.100-mg/cubic meter range. We have therefore adopted the 0.100 mg/cubic meter guideline. The airborne particulate level in all areas tested was well below our guideline.

With the exception of the stairwell adjacent to the gymnasium and the main office, all *TVOCs* were below 100 PPB (0.1 PPM). The levels are considered average to low when compared to historical data we have collected for buildings of similar age, design and utilization.

Neither OSHA nor The American Conference of Governmental Industrial Hygienists promulgates an exposure standard for *TVOCs* both instead opting for limits on each individual compound. The OSHA PEL for the majority of compounds with common construction applications is in the 25 - 100 PPM range. The PEL for some of the more exotic compounds are as low as .5 PPM. Assuming a worst-case scenario, *TVOC* levels should not exceed .5 PPM (500 PPB).

100 PPB is roughly equivalent (there can be variation based upon molecular weights of individual volatile organic compounds) to the Selfert "target guideline value" of 0.3 mg/M³.

With the exception of the stairwell adjacent to the gymnasium and the main office, all samples collected within the areas tested were below the implied OSHA limit and the Selfert "target guideline value".

CO was not detected throughout the areas tested. The limit of detection for the method is 1 PPM. The OSHA limit, for comparison purposes, is 30 PPM and the ACGIH TLV is 25 PPM. We assume a safety factor of 10 for schools, yielding a guideline of 2.5 PPM.

Housekeeping was assessed as "good" all areas. Housekeeping is a relevant factor in terms of air quality as poor housekeeping could lead to microbial amplification.

CO_2 levels were within the acceptable range in these areas. The peak level was encountered in multiple areas (400 PPM). For comparative purposes, fresh outdoor air has approximately 320 PPM of CO_2. All areas were well below the OSHA/NIOSH limit of 5000 PPM. Results were below the Massachusetts Department of Health guideline of 800 PPM for publicly occupied buildings. If there were a CO_2 problem, comfort impairment would begin at approximately 1000 PPM. Exposure to high levels of CO_2 for prolonged periods could cause building occupants to become lethargic and generally uncomfortable. CO_2 levels will rise over the course of the day especially in those areas, which have a high occupancy. The levels are considered very low. The levels were almost certainly higher when the building was occupied. Yet, the AHU appears to be very efficient. The diffusers were too high to test for air velocity. Nonetheless, the AHU system in this building appears to be moving a great deal of fresh air into the building.

The Massachusetts Building Code requires a minimum ventilation rate of 15 cubic feet per minute (cfm) per occupant of fresh outdoor air or has operable windows in each room (SBBRS, 1997; BOCA, 1993). The ventilation must be on at all times while the room is occupied. All rooms are heated by forced hot air.

5.0 Conclusions:

With the exception of the Gymnasium stairwell and main office, all IAQ parameters were within an acceptable range.

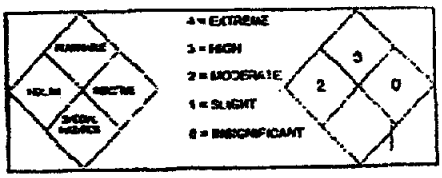
The stairwell and main office should be aired out by opening the exterior door and drawing fresh outdoor air into the area by means of a high capacity fan.

Reference:

1. AIHA, 2700 Prospect Ave., Fairfax, VA. IAQ Paper #130. June 23, 1998.
2. Seifert, B. Regulation Indoor Air. In: Indoor Air '90, Proceedings of the 5th International Conference on Indoor Air Quality and Climate, Volume V, p. 35. Toronto 1990.
3. American Society of Heating, Refrigeration and Air-conditioning Engineers' ANSI/ASHRAE 55-1992 **"Thermal Environmental Conditions for Human Occupancy."**
4. BOCA, 1993, The BOCA National Mechanical Code - 1993. 8th edition. Building Officials and Code Administrators International, Inc., Country Club Hills, Il.
5. SBBRS, 1997. Mechanical Ventilation State Board of Building Regulations and Standards Code of Mass Regulations 780 CMR 1209.0

MATERIAL SAFETY DATA SHEET

GAF MATERIALS CORPORATION



EverGuard TPO Bonding

Manufacturer	GAF MATERIALS CORPORATION
Address	1361 Alps Road
	Wayne, NJ 07470
Phone Number (For Information)	800-766-3411
Emergency Phone Number	800-424-9300

EverGuard TPO Bonding Adhesive	
Identity (Trade Name As Used On Label)	
MSDS Number*	1079 C
CAS Number*	None
Date Prepared	10/4/01 REV 06/03
Prepared By*	Bill Kuhn

NOTE: Blank spaces are not permitted. If any item is not applicable, or no information is available; the space must be marked to indicate that

SECTION 1 – MATERIAL IDENTIFICATION AND INFORMATION

COMPONENTS – Chemical Name & Common Names (Hazardous Components 1% or Greater; Carcinogens 0.1% or greater)	%*	OSHA PEL-TWA	ACGIH TLV-TWA	OTHER LIMITS RECOMMENDED
Heptane (CAS # 142-82-5)	23-24	500 ppm	400 ppm	N/A
Toluene (CAS# 108-88-3)	47-48	200 ppm	50 ppm	N/A
Non-Hazardous Ingredients	25-29			
Total	100			

SECTION 2 – PHYSICAL/CHEMICAL CHARACTERISTICS

Boiling Point	200-220F	Specific Gravity (H2O = 1)	0.842
Vapor Pressure (mm Hg and Temperature)	40 mmHg @ 68F	Flashpoint	20F
Vapor Density (Air = 1)	3.50 (Air = 1)	Evaporation Rate (Butyl Acetate = 1)	4.5
VOC (less water and exempt solvent)	5.209 lb/gal	Volatile (% Wt or % Vol)	71.4853% Weight
Static Electricity Explosion	Yes	Density	7.0066 lb/gal

Appearance and Odor: Amber or Green liquid. Turpentine/paint thinner odor.

SECTION 3 - FIRE AND EXPLOSION HAZARD DATA

Flash Point and Method Used	20 F Setn	Auto-Ignition Temperature	396F	Flammability Limits in Air % by Volume: LEL 1% volume in Air; UEL 7.0 % volume in Air

Extinguisher Media: Dry chemical, carbon dioxide, foam water spray or fog, and vaporizing liquid type extinguishing agents may all be suitable. Water may be an ineffective extinguishing agent unless used under favorable conditions by experienced fire fighters trained in fighting all types of flammable liquid fires.

Special Fire Fighting Procedures: Wear a self-contained breathing apparatus with a full face piece operated in the positive pressure demand mode with appropriate turn-out gear and chemical resistant PPE. Avoid spreading burning liquids with water used for cooling purposes. Fire protection and fire response strategy should be planned through consultation with local fire protection authorities or appropriate specialists.

Unusual Fire and Explosion Hazards: Material is flammable and volatile. Vapors are heavier than air and may travel along the ground or may be moved by ventilation and ignited by pilot lights, other flames, sparks, heaters, smoking, electric motors, static discharge, or other ignition source at locations distant from material handling point. Avoid open flames and other ignition sources in storage and in use, especially in spray applications. Not to be used where inadequate ventilation is likely or where vapor concentrations are flammable.

SECTION 4 - REACTIVITY HAZARD DATA

STABILITY	Stable X	Conditions To Avoid	Avoid exposure to heat, sparks, open flames and other ignition sources which induce combustion and/or thermal decomposition.
	Unstable ___		

Incompatibility (Materials to Avoid): Avoid contact with strong acids (mineral acids) or strong oxidizing agents

Hazardous Decomposition Products: Carbon monoxide and carbon dioxide, acrid (choking) smoke and fumes, various hydrocarbons and other unidentified organic compounds and toxic substances

HAZARDOUS POLYMERIZATION

___ May Occur _X_ Will Not Occur

* Optional

SECTION 5 - HEALTH HAZARD DATA

PRIMARY ROUTES OF ENTRY:	CARCINOGEN LISTED IN:
_x_ Inhalation _x_ Skin Absorption ___ Ingestion ___ Not Haz	__ NTP __ IARC Monograph __ OSHA __x_ Not Listed

HEALTH HAZARDS	Acute irritation can occur for short term overexposure
	Chronic (See below)

Signs and Symptoms of Exposure: Can cause stinging, burning tearing redness & swelling of the eyes. Can cause drying, burns & dermatitis of the skin. Inhalation can cause irritation of the nose, throat & airways, incl. dizziness, headache, nausea, confusion. Ingestion can cause irritation of the mouth, throat, gastro-intestinal tract, abdominal pain, vomiting & diarrhea. Aspiration hazard if swallowed, can enter lungs and may cause chemical pneumonitis, which can be fatal.

Medical Conditions Generally Aggravated by Repeated Overexposure: Prolonged occupational overexposure to organic solvents could be associated with various neurotoxic effects including permanent brain and nervous system damage. Symptoms include loss of memory, loss of intellectual ability and loss of coordination. Chronic skin exposure to skin may cause similar effects

EMERGENCY FIRST AID PROCEDURES -

Eye Contact Flush eyes gently with water for at least 15 minutes while holding eyelids apart. Consult physician.

Skin Contact Wash exposed skin area with soap and water. Consult physician if irritation persists. Launder contaminated clothing before reuse

Inhalation Remove individual to fresh air. If breathing is difficult administer oxygen. If breathing has stopped begin artificial respiration. Seek immediate medical attention.

Ingestion Do not induce vomiting. Seek medical attention.

Note to physician: Any treatment that might be required for overexposure should be directed at the control of symptoms and the clinical condition.

SECTION 6 - CONTROL AND PROTECTIVE MEASURES

Respiratory Protection (Specify Type) If the TLV or PEL for the product or any component is exceeded in the workplace air, a NIOSH/OSHA approved respirator is advised. Engineering controls should be implemented to reduce exposure.

Protective Gloves: The use of chemical resistant gloves is recommended. Wear impervious clothing if necessary.	**Eye Protection** Chemical splash goggles are advised.

VENTILATION TO BE USED	_x_ Local Exhaust		_x_ Mechanical (General)
	___ Special	___ Other (Specify)	

Other Protective Clothing and Equipment If necessary, wear impervious clothing and boots

Hygienic Work Practices Practice safe working procedures and good personal hygiene. Use PPE when necessary. Wash thoroughly after handling and before eating, drinking, smoking, or toilet facilities.

SECTION 7 – PRECAUTIONS FOR SAFE HANDLING AND USE/LEAK PROCEDURES

Steps to be Taken if Material is Spilled or Released Eliminate all ignition sources such as flames (including pilot lights), electric sparks, etc. Stop spill at source. Contain spilled liquid with sand, earth, vermiculite or other inert absorbent material. This material is a water pollutant and should be prevented from contaminating soil or from entering sewage and drainage systems and other bodies of water. Notify authorities.

Waste Disposal Methods Do not flush to sewer. Dispose of in accordance with all applicable federal, state or provincial, and local laws and regulations. RCRA hazardous material 40 CFR PART 260 et. seq.

Precautions to be Taken in Handling and Storage Handle with reasonable care. Avoid breathing vapors, spray mist, eye contact, and repeated or prolonged skin contact. Observe appropriate static grounding procedures for flammable liquids. Do not transfer in unmarked container. Containers may be hazardous when emptied because of residue retained. Solvent can become electrostatically charge during mixing, filtering, or pumping at high flow rates: sparks can form and ignite the vapor. Thoroughly evaluated and safe operating conditions must be established and maintained.
Keep product container cool, dry, and away from sources of ignition. Use and store this product with adequate ventilation. Keep containers tightly closed when not in use. Product may corrode, degrade, or otherwise react with some metals and plastics upon prolonged contact.

Other Precautions and/or Special Hazards: The following complies with the California safe Drinking Water and Toxic Enforcement Act of 1986:
Warning: This product contains a chemical(s) known to the state of California to cause cancer
Warning: This product contains a chemical(s) known to the state of California to cause birth defects and/or other reproductive harm.