



# Markers

Healthy Schools Network, Inc.

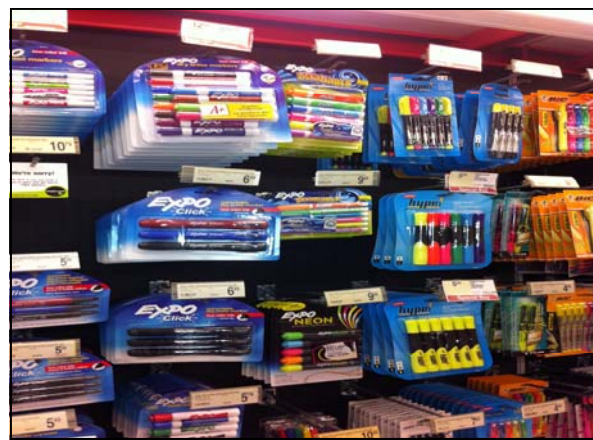
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- Dry erase whiteboards come with toxic dry erase markers and toxic cleaning products.
- Did you know that some schools require children to use individual whiteboards and toxic markers at their seats?
- Dry erase markers labeled “nontoxic” are not free of toxic chemicals and can cause health problems.

## Children Are Not Just Little Adults

Children are especially vulnerable to environmental health hazards; moreover, schools commonly have problems with indoor air pollution, as they are more densely occupied than commercial offices and not well-maintained. Children are at risk for exposures to hazards through breathing, touching, and tasting the world around them, and by working directly with toxic instructional products. Children eat, drink, and breathe more per pound of body weight than adults, and cannot identify and avoid hazards. Children also play on the floor or ground where they may inhale pollutants or absorb chemicals through their skin.



## Schools Are Not Just Little Offices

*55 million children attend U.S. schools every day*

- Indoor air pollution is already undermining health, learning, and productivity in schools.
- No regulatory authority oversees children’s environmental health problems that arise at school.
- Chemical fumes and odors affect everyone, but especially children.
- Preventing exposures should be a top priority for adults on the job and for children at school.

## RECOMMENDATIONS

- Children should not use permanent or dry erase markers at school or at home.
- Teachers whose classrooms have whiteboards should use the lowest-odor, small-tip dry erase markers and maintain good ventilation in the classroom.
- Schools should avoid buying or recommending supplies that contain or require the use of hazardous chemicals: whiteboards, paints, glues, air fresheners, cleaning products, pest control products.
- If your child is healthy at home and often sick at school, find out about the environment at school.
- To promote constructive changes at school, see [http://www.healthyschools.org/what\\_you\\_can.html](http://www.healthyschools.org/what_you_can.html).

## HEALTH EFFECTS REPORTED BY ADULTS USING PERMANENT OR DRY ERASE MARKERS

“Blurred vision, severe nasal congestion, ringing in the ears, headache, dizziness, difficulty concentrating, drowsiness, nausea, decreased fine motor coordination, ...” and more were reported by a researcher in 2003. Symptoms will vary by individual, and will depend on the actual ingredients of the various markers, the proximity to marker fumes, the concentration of fumes present, and the duration of exposure.

### 2003 STUDY SHOWED HEALTH EFFECTS IN MICE

“To evaluate complaints of adverse reactions to marking pen emissions, groups of mice were exposed for 1 h to the emissions of 8 brands of felt-tip markers or white-board cleaner.... Sensory irritation, pulmonary irritation, and/or air flow limitation, of differing intensities were documented with each of the eight brands tested.... Emissions from all eight of the pens produced behavioral abnormalities such as altered posture and gait, tremors, falling, and hyperactivity. The exposure concentrations were similar to the total volatile organic compounds (TVOC) values near marking pens in actual use.... All marking pens were labeled “nontoxic” and “conforms to ASTM 4236”, an industry standard for potentially toxic art materials....” *Acute Toxicity of Marker Pen Emissions*, Anderson RC, Anderson JH, [J Toxicol Environ Health A](http://www.tohjournal.org/). 2003 May 9; 66(9):829-45. There are no published studies on health effects in mice or children with more intense use: a classroom full of children, each with one or more uncapped dry erase markers in use on individual whiteboards, for 1-3 hours of seat work daily Monday – Friday.

### CHEMICALS COMMONLY USED IN PERMANENT AND DRY ERASE MARKERS

Not all markers have the same ingredients, but nearly all have an industry label of “nontoxic”; some markers are also packaged as “low odor” or “washable” or scented. Volatile chemicals are added to help marker inks dry quickly; and fragrances often contain phthalates. Marker fumes come from chemicals evaporating. Listed below are chemicals found on the Material Safety Data Sheets (MSDSs) of popular markers marketed to back-to-school buyers (see <http://www.officeworld.com/Worlds-Biggest-Selection/5728/11Q3/>), along with the health effects of chemicals (see <http://www.cdc.gov/niosh/npg/>). Remember: while markers contain only tiny amounts of chemicals, many adults and children — and mice— have health effects. MSDS information applies only to adult workers.

**Butanol:** irritation eyes, skin, throat; headache, drowsiness blurred vision, photophobia (abnormal visual intolerance to light); dermatitis; possible auditory nerve damage, hearing loss; central nervous system depression. **Diacetone alcohol:** irritation eyes, skin, nose, throat; corneal damage. **Ethanol:** irritation eyes, skin, nose; headache, drowsiness, lassitude (weakness, exhaustion). **Iso-Propanol/Isopropyl alcohol** (rubbing alcohol): irritation eyes, nose, throat; drowsiness, dizziness, headache. **Methyl isobutyl ketone:** irritation eyes, skin, mucous membrane; headache, narcosis, coma; dermatitis. **Monobutyl ether (2-butoxy-ethanol):** irritation eyes, skin, nose, throat; destruction of red blood cells; blood in urine; central nervous system depression, headache; vomiting.

### MORE RECOMMENDATIONS

- **ALTERNATIVES:** dry erase wax crayons; watercolor markers; paper and pencil or erasable pen.
- **Teachers:** maintain ventilation by opening windows or making sure unit ventilators are circulating fresh air. One permanent marker can be reserved for special labeling needs.
- **School Officials:** adopt a “green purchasing policy” that reduces or eliminates pollutants inside schools from products such as whiteboards, markers, paints, glues, cleaning products, and pest control products.

**Tip from a Minnesota parent:** “P.S. When my kids were in school, teachers simply included an old sock on their school lists for cleaning the boards instead of the packaged white board fluid!”

# The Robust Science of Healthy School Environments

- **Green Schools: Attributes for Health and Learning**, National Research Council of the National Academy of Science, 2006.  
See [http://books.nap.edu/catalog.php?record\\_id=11756](http://books.nap.edu/catalog.php?record_id=11756). The expert panel found that there is a “robust science” behind healthy indoor environments, and recommended that “conventional green schools” also be designed for health benefits by addressing the following concerns: dryness, that is, keeping the site and building materials dry to help prevent mold and using mold-resistant building techniques; good indoor air quality through proper ventilation and use of less-toxic interior materials; quietness, acoustical controls; well-maintained systems, that is, following construction with “building commissioning” to ensure that all systems work as specified; and cleanliness through ensuring that the building is durable and easy to maintain (ex., accessible custodial closets, durable finishes and flooring).
- **Science-Based Recommendations to Prevent or Reduce Potential Exposure to Biological, Chemical, and Physical Agents in Schools**, Derek G. Shendell, et al., **Journal of School Health** – December 2004, Vol. 74, No. 10, a review of peer-reviewed publications and proceedings.
- **A Summary of Scientific Findings on Adverse Effects on Indoor Environments on Student’s Health, Academic Performance and Attendance**, 2004, US Department of Education, Office of the Under Secretary, Doc # 2004-06, Washington, DDC, 2004., prepared for Congress pursuant to HHPS/NCLB.
- **Do Indoor Pollutants and Thermal Conditions In Schools Influence Student Performance?** A Critical review of the Literature, M.J. Mendell, G.A. Heath, *Indoor Air*, Volume 15 Issue 1 Page 27 – January 2005
- **Greening America’s Schools: Costs and Benefits**, Gregory Katz, *Capital E*, October 2006. Studies cited include those indicating that healthy indoor environments can achieve an 87% reduction in flu, 67% reduction in Sick Building Syndrome, 46% reduction in upper respiratory problems, and 39% reduction in asthma at school. Asthma is the leading cause of school absenteeism due to chronic illness and a leading occupational illness among teachers and custodians. See <http://www.greenbuildingpages.com/KatzGreenSchools.pdf>.

**The Healthy Schools/ Healthy Kids Clearinghouse** was created in 1996 to deliver *simple, technically accurate, widely supported and consistent* directions to parents and others in the school community on how to improve schools and children’s health.

The Clearinghouse was honored to receive a  
2005 US EPA Office of Children’s Health Protection Recognition Award.



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