State of Wisconsin
DEPARTMENT OF NATURAL RESOURCES
1027 W. Saint Paul Avenue
Milwaukee WI 53233

Tony Evers, Governor
Preston D. Cole, Secretary
Telephone 608-266-2621
Toll Free 1-888-936-7463
TTY Access via relay - 711

June 10, 2022

Mr. A. H. Mattacotti
Milwaukee Plating Company
1434 N. Vel R. Phillips Ave.
Milwaukee, WI 53212-3888
Via Electronic Mail Only to ahm@milwaukeeplating.com

SUBJECT: **Wisconsin Administrative Code ch. NR 708 – Immediate Action Required**
Milwaukee Plating Co., 1434 N. Vel R. Phillips Ave., Milwaukee, WI
BRRTS #02-41-000826, FID #241036840

Dear Mr. Mattacotti:

The Wisconsin Department of Natural Resources (DNR) has been provided with air sampling data collected by the Wisconsin Department of Health Services (DHS) that indicates that a hazardous substance discharge from the Milwaukee Plating Company facility poses an imminent threat to the public health, safety, or welfare of the occupants of the adjacent building at 1422 N. Vel R. Phillips Avenue (1422 building), in Milwaukee.

Trichloroethylene (TCE) has been detected at concentrations that exceed the vapor action level (VAL) in indoor air samples collected on all floors of the adjacent 1422 building. The DNR has evaluated the lines of evidence and at this time Milwaukee Plating is identified as the source of the TCE in the 1422 building based on the following: Milwaukee Plating uses TCE in its degreasing operations on the south side of the building, near the alley between your facility and the 1422 building; there are multiple doors and vents on the south wall of the Milwaukee Plating facility that open into the alley; and on multiple occasions TCE concentrations have been recorded in outdoor air samples collected in the alley that are higher than TCE concentrations within the 1422 building. TCE is of special concern from a human health perspective due to its potential for acute (short-term) health risks at relatively low concentrations in air. The DHS letter to the DNR, *DHS response to Request for Assistance: Actions for Trichloroethylene at Acute Risk Levels*, dated March 25, 2021, which provides recommendations for when immediate action is necessary and recommendations for appropriate immediate actions, is attached for your reference.

The data table for the DHS indoor air sampling conducted in April 2022 is attached for your reference. Passive sampling was conducted on all floors of the building, with TCE exceeding the VALs on all floors and high concentrations outside of the building in the alley. DHS is preparing a narrative to accompany the data at this time. The current owner of the 1422 building has also conducted vapor sampling with similar indications of TCE exceedances throughout the building and would be willing to share its results with you.

Immediate Actions – NR 708.05: The law requires you to take any immediate actions needed to halt and minimize harmful effects of TCE that are impacting the 1422 building and to submit documentation describing immediate actions and outcomes to the DNR within 45 days of the date of this letter. A final immediate action report should be submitted in accordance with Wis. Admin. Code § NR 708.05.

The need for interim and remedial actions should be evaluated based on the effectiveness of the immediate action requested above and the results of the site investigation in accordance with Wis. Admin. Code §§ NR 708.11, NR 722.07.

Contact Curtis Hedman of DHS for health-related questions. The DHS *TCE in the workplace* fact sheet is also provided for your reference and consideration regarding potential TCE risk on your property.

If you have any questions or would like to discuss anything in this letter, please contact me, the DNR Project Manager, at 414-435-8010, or at linda.michalets@wisconsin.gov.

Sincerely,

Linda Michalets
Hydrogeologist
Remediation and Redevelopment Program

Enclosures: *DHS response to Request for Assistance: Actions for Trichloroethylene at Acute Risk Levels*
DHS vapor data table for passive monitoring in April 2022
TCE in the workplace, DHS fact sheet, P-03201, February 2022

cc: James Drought, GZA GeoEnvironmental, Inc. (James.Drought@gza.com)
Curtis Hedman, Wisconsin Department of Health Services (Curtis.Hedman@dhs.wisconsin.gov)
Lindor Schmidt, City of Milwaukee (leschmi@milwaukee.gov)

Tony Evers
Governor

Karen E. Timberlake
Secretary

State of Wisconsin
Department of Health Services

DIVISION OF PUBLIC HEALTH

1 WEST WILSON STREET
PO BOX 2659
MADISON WI 53701-2659

Telephone: 608-266-1251
Fax: 608-267-2832
TTY: 711 or 800-947-3529

March 25, 2021

Christine Haag
Program Director
Remediation and Redevelopment Program
Wisconsin Department of Natural Resources
101 S. Webster Street, P.O. Box 7921
Madison, WI 53707-7921

Subject: DHS response to Request for Assistance: Actions for Trichloroethylene at Acute Risk Levels

Dear Ms. Haag:

The Wisconsin Department of Health Services (DHS) received your letter dated October 18, 2019 requesting clarification on the definition of acute risk and timeline justifications for responding to various scenarios where the acute risk is related to volatile organic compounds (VOCs) and vapor intrusion (VI).

This request for clarification is intended to augment a December 7, 2017 DHS letter to the Wisconsin Department of Natural Resources (DNR) providing recommendations for when immediate action is needed in response to written comments on proposed revisions to the RR-800 document. Specifically, DHS concurred with DNR's position that immediate action is justified when indoor air is found to be present at three (3) times the indoor air vapor action level (VAL) or sub-slab vapor risk screening level (VRSL) for a non-carcinogen or ten (10) times the VAL or VRSL for a carcinogen. In addition, DHS supported the DNR's position that immediate action be taken when trichloroethylene (TCE) is present in indoor air above the VAL and when women of child-bearing age are present.

DHS response:

DHS clarification statements defining acute risk and justifying timelines for responding to acute risk follow for each of the DNR scenarios presented in the request letter:

1. **Clarification from DHS that acute risk necessitates immediate action as defined in s. NR 700.03(28), Wis. Admin. Code.**

   To reinforce the finding in the December 7, 2017 letter, DHS is in agreement that DNR's immediate action as defined in s. NR 700.03(28), Wis. Admin. Code is warranted when acute risk is observed as discussed in DNR's Vapor Intrusion Guidance RR800 (2018). For all contaminants with the exception of trichloroethylene (TCE) when women of childbearing years (age 15 to 44) are present, acute risk is defined as indoor air concentrations that are three times over the vapor action limit (VAL) for non-carcinogens

or ten times over the VAL for carcinogens. For TCE where people who are or may become pregnant occupy a dwelling, acute risk is defined as indoor air concentrations that are equal to or over the VAL (HI $\geq$ 1). These immediate action guidelines are in agreement with EPA guidance. The following statement is from the EPA OSWER Technical Guide for Assessing and Mitigating the Vapor Intrusion Pathway from Subsurface Vapor Sources to Indoor Air (EPA 2015): "Although the indoor air concentrations may vary temporally, an appropriate exposure concentration estimate (e.g., time-integrated or time-averaged indoor air concentration measurement in an occupied space) that exceeds the health-protective concentration levels for acute or short-term exposure (i.e., generally considered to be a hazard quotient (HQ) greater than one for an acute or short-term exposure period) indicates vapor concentrations that are generally considered to pose an unacceptable human health risk."

2. **Clarification from DHS that trichloroethylene (TCE) present in indoor air above the applicable VAL qualifies as an acute risk to women of child-bearing years.**

DNR basis its VAL and VRSL values on EPA regional screening levels (RSLs) for indoor air. These values are developed using reference concentrations (RfCs) from EPA's toxicological assessments developed for its Integrated Risk Information System (IRIS). The non-cancer chronic inhalation RfC of $2x10^{-3}$ mg/m^3 in EPAs toxicological assessment for TCE (2011) is based upon two rodent drinking water exposure studies. One study (Kiel et al., 2009) reported an immunotoxic effect of TCE presenting as a reduced thymus weight in female mice. The other study reported an increased incidence of fetal cardiac malformations (Johnson et al., 2003). The cardiac malformation developmental endpoint drives the concern over short term exposure to TCE. Although some limitations were reported with the Johnson et al. study (2003), the cardiac malformations finding has been confirmed by several reviews since, including the EPA Office of Solid Waste and Emergency Response (2014), ATSDR (2014), the Massachusetts Department of Environmental Protection (MADEP, 2014), a group of EPA researchers (Makris et al, 2016), and the North Carolina Department of Environmental Quality (NC DEQ, 2018). These reviews found that a two- to three-fold increase in congenital heart defects were observed in multiple animal studies and that the most frequently observed heart defects were also reported in humans exposed to TCE-containing VOCs in several epidemiological studies (Brender et al. 2014, Dawson et al. 1993). These reviews also found that mechanistic support exists with studies in avian and mammalian cells demonstrating that TCE exposure alters processes that are critical to normal valve and septum formation. Although a recent EPA TSCA Risk Evaluation for TCE (2019) used the immunotoxic end point and not the fetal cardiac malformation end point for their risk determinations, the EPA Science Advisory Committee on Chemicals (SACC) was split on whether to use the fetal heart malformations endpoint for risk consideration and the TSCA Risk Evaluation was not allowed to consider epidemiological evidence or the effects of TCE exposure from air, contaminated waste sites, groundwater used for drinking water, and food in their evaluation.

The EPA identifies that a single exposure at any of several developmental stages may be sufficient to produce an adverse developmental effect (EPA, 1991). In humans, the cardiac system is the second to develop following fertilization, with cardiac development beginning at approximately 3 weeks following implantation. Substantial cardiac system development continues through 8 to 9 weeks post implantation, with the most sensitive period of cardiac development occurring in 3 to 6 weeks (Smart and Hodgson, 2018). These critical fetal heart development windows occur during a time period when an individual may not yet know they are pregnant. Rapid actions should be taken to minimize the potential for TCE exposures during these timeframes (EPA 2014, EPA Region V, 2020).

3. **Health-based recommended responses including the definition of critical exposure windows with scientific justification to help inform DNR determination of time lines for immediate (s. NR 700.03(28), Wis. Admin. Code) and interim (s. NR 700.03(29), Wis. Admin. Code) actions in the following scenarios:**

    a. **TCE is present beyond the envelope of a building at or above the applicable Vapor Risk Screening Level (VRSL);**

    DHS recommends an evaluation of the demographics for the building. If persons of childbearing years occupy the dwelling, indoor air samples should have a quick turnaround time (24 to 72 hours, EPA Region 9, 2014). Women in the sensitive demographic should be consulted about the potential TCE developmental toxicity risk so they may make informed decisions in terms of staying in the dwelling during the timeframe of the indoor air assessment. DHS or local health can assist with this consultation. If the indoor air TCE sample result exceeds the VAL, DHS recommends interim action (carbon filter unit) and rapid installation of sub-slab depressurization system within two weeks. If the indoor air TCE sample result is less than the VAL, mitigate and monitor indoor air in interim to ensure exposure is not occurring and move toward installation of a mitigation system within 4 to 8 weeks, depending upon the building's complexity and need for system design.

    b. **Non-carcinogenic compounds are present beyond the envelope of a building at or above three (3) times the applicable VRSL;**

    The U.S. EPA defines a reference concentration (RfC) as an estimate (with uncertainty spanning perhaps an order of magnitude) of a continuous inhalation exposure of a chemical to the human population through inhalation (including sensitive subpopulations), that is likely to be without an appreciable risk of deleterious effects during a lifetime (IRIS Glossary, 2020). When a non-carcinogenic VOC is three times above the applicable VRSL, the risk of that VOC being present in indoor air at levels that can cause an adverse health effect is high enough to warrant urgent action including indoor air sampling with 24 to 72 hour turnaround time and mitigation within 4 to 8 weeks, or sooner where indoor air sampling results indicates a VAL exceedance.

c. Carcinogenic compounds are present beyond the envelope of a building at or above ten (10) times the applicable VRSL;

VRSLs are established in Wisconsin with a 10^{-5} cancer risk. When a carcinogenic compound is present in indoor air at or above ten times the applicable VRSL, the cancer risk exceeds 10^{-4} cancer risk. The risk of cancer occurrences from continuous exposure is therefore high enough to warrant the installation of a mitigation system within 4 to 8 weeks, depending upon the building's complexity and need for system design.

d. TCE is present in indoor air below the applicable VAL

Review sub-slab results when available. If sub-slab TCE data is also below VRSL, additional assessment should take place with normal laboratory turnaround time to confirm results are below action levels. If women of childbearing years occupy the building, an additional sampling round should take place as soon as feasible to ensure levels above VAL/VRSL is not present.

e. Non-carcinogenic compounds are present in indoor air between the applicable VAL and three (3) times the applicable VAL;

Move toward mitigation system installation within 4 to 8 weeks, depending upon complexity and need for system design. Perform indoor air sampling to confirm mitigation system is effective.

f. Carcinogenic compounds are present in indoor air between the applicable VAL and ten (10) times the applicable VAL;

Move toward mitigation with a recommended timeframe of 4 to 8 weeks, depending upon complexity and need for system design. Perform indoor air sampling to confirm mitigation system is effective.

g. TCE is present in indoor air at or above the applicable VAL;

DHS recommends an evaluation of the demographics for the building. If women of childbearing years occupy the building, implement interim actions such as carbon filtration units to interrupt the TCE exposure. Move toward installation of a mitigation system within two weeks. Women in the sensitive demographic should be consulted about the potential TCE developmental toxicity risk so they may make informed decisions in terms of staying in the dwelling during the timeframe of the indoor air assessment.

h. Non-carcinogenic compounds are present in indoor air at or above three (3) times the applicable VAL;

The U.S. EPA defines a reference concentration (RfC) as an estimate (with uncertainty spanning perhaps an order of magnitude) of a continuous inhalation exposure of a chemical to the human population through inhalation (including sensitive subpopulations), that is likely to be without an appreciable risk of deleterious effects during a lifetime (IRIS Glossary, 2020). When a non-carcinogenic VOC is three times above the applicable VAL, the risk of adverse health effects occurring from continuous exposure is high enough to warrant the installation of a mitigation system within 4 to 8 weeks, depending upon the building's complexity and need for system design. Depending upon how far above the VAL the concentration is, more urgent actions may be needed, and the local health officer should be consulted for potential abatement orders, placarding, and temporary relocation of occupants per Section 254 Wis. Admin. Code.

i. Carcinogenic compounds are present in indoor air at or above ten (10) times the applicable VAL.

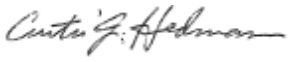
When a carcinogenic compound is present in indoor air at or above ten times the applicable VAL, the cancer risk exceeds 10^{-4} cancer risk. The risk of cancer occurrences from continuous exposure is therefore high enough to warrant the installation of a mitigation system within 4 to 8 weeks, depending upon the building's complexity and need for system design. Depending upon how far above the VAL the concentration is, more urgent actions may be needed, and the local health officer should be consulted for potential abatement orders, placarding, and temporary relocation of occupants per Section 254 Wis. Admin. Code.

4. Health-based recommendations for when sampling indoor air at commercial or industrial businesses is necessary in light of the recent Department of Defense study on sewers and utility tunnels as preferential pathways (*Sewers and Utility Tunnels as Preferential Pathways for Volatile Organic Compound Migration into Buildings: Risk Factors And Investigation Protocol,* ESTCP Project ER-201505).

DHS agrees with the finding in the DoD study that indoor air should be part of the VI assessment where evidence of preferential pathways might be feasible. This evidence may include detection of VOCs in sewer lines or utility corridors. Recent experience has shown instances where indoor air levels are found at high levels due to preferential pathway contamination through open sumps, openings in foundations, and poorly sealed conduits. DHS also recommends sampling indoor air when environmental sampling (groundwater, soil, or soil gas) indicates that indoor air action levels could be exceeded. When TCE is the contaminant of concern, indoor air should always be evaluated to assist with the risk assessment and be able to interrupt exposures as soon as possible to sensitive populations to prevent the known reproductive/developmental endpoint. When commercial or industrial businesses are users of the VOCs being studied, those chemicals may need to be temporarily removed prior to the indoor air assessment, where feasible.

Thank you for the opportunity to provide feedback on this topic. Please contact me at (608) 266-6677, or curtis.hedman@wisconsin.gov if you have any follow up questions or comments about this response.

Sincerely,



Curtis Hedman, Ph.D.
Toxicologist
Bureau of Environmental and Occupational Health

Cc: Jennifer Borski, Vapor Intrusion Team Leader, DNR R&R Program
Judy Fassbender, NR Program Manager, DNR R&R Program
Roy Irving, Chief, DHS Hazard Assessment Section, BEOH
Mark Werner, Chief, DHS BEOH

Enc: Summary of DHS response to Request for Assistance: Actions for Trichloroethylene at Acute Risk Levels

References:

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Enclosure: Summary of DHS response to Request for Assistance: Actions for Trichloroethylene at Acute Risk Levels

DNR Ask	DHS Response	Supporting Reference(s)
1) Clarification from DHS that acute risk necessitates immediate action as defined in s. NR 700.03(28), Wis. Admin. Code.	**A)** Immediate action as defined in NR 700.03(28) warranted if: for compounds except TCE = 3x VAL, or 10x VAL carcinogens; TCE w/ women age 15-44 = VAL	**A)** December 7, 2017 DHS letter and EPA OSWER Tech Guide (2015)
2) Clarification from DHS that trichloroethylene (TCE) present in indoor air above the applicable VAL qualifies as an acute risk to women of child-bearing years	**A)** VALs&VRSLs based on EPA RSLs **B)** RSL for TCE is based on immunotox. and fetal cardiac development endpoints **C)** findings confirmed by reviews **D)** also consistent with epi study findings **E)** single exposure during development can have harmful effect **F)** critical development window 3 to 6 weeks **G)** rapid action warranted for TCE > RSL	**A)** EPA tox assessment TCE (2011) **B)** Kiel et al. (2009) Johnson et al. (2003) **C)**EPA OSWER (2014), ATSDR (2014), MADEP (2014), Makris et al (2016), NC DEQ (2018) **D)**Brender et al. (2014), Dawson et al. (1993) **E)**EPA (1991) **F)** Smart and Hodgson (2018) **G)** EPA 2014, EPA Region V (2020)
3) Health-based recommended responses including the definition of critical exposure windows with scientific justification to help inform DNR determination of time lines for immediate (s. NR 700.03(28), Wis. Admin. Code) and interim (s. NR 700.03(29), Wis. Admin. Code) actions in the following scenarios:		
a) TCE is present beyond the envelope of a building at or above the applicable Vapor Risk Screening Level (VRSL)	**A)** evaluate demographics in building **B)** sample indoor air with 24-72 hour TAT **C)** consult w/ women 15-44 about TCE **D)** if TCE >VAL, carbon filtration w/in 48 hours and sub-slab system w/in 2 weeks **E)** if TCE <VAL, perform another indoor air sample and sub-slab system w/in 4-8 weeks	**B)** EPA Region 9, (2014) WI DNR RR800 (2018), EPA Reg V (2020)
b) Non-carcinogenic compounds are present beyond the envelope of a building at or above three (3) times the applicable VRSL	**A)** RfC is estimate, ca. order of magnitude, of concentration w/o harm over lifetime **B)** >3x that level cuts significantly into that safety factor **C)** indoor air sampling with 24-72 hour TAT **D)** sub-slab system w/in 4-8 weeks if >VAL	**C)** EPA Region 9, (2014) WI DNR RR800 (2018), EPA Reg V (2020)
c) Carcinogenic compounds are	**A)** VRSLs est. w/ 10^{-5} cancer risk	WI DNR RR800 (2018), EPA Reg. V (2020)

present beyond the envelope of a building at or above ten (10) times the applicable VRSL	**B)** >10x that exceeds 10^{-4} cancer risk **C)** sub-slab system w/in 4-8 weeks if >10x VRSL	
d) TCE is present in indoor air below the applicable VAL	**A)** verify TCE in sub-slab is not >VRSL **B)** If TCE also <VRSL; one more sampling event **C)** do follow up samples soon as possible if women age 15-44 live in building	WI DNR RR800 (2018), EPA Reg. V (2020)
e) Non-carcinogenic compounds are present in indoor air between the applicable VAL and three (3) times the applicable VAL	**A)** sub-slab system w/in 4-8 weeks **B)** sample to confirm system is effective	WI DNR RR800 (2018), EPA Reg. V (2020)
f) Carcinogenic compounds are present in indoor air between the applicable VAL and ten (10) times the applicable VAL	**A)** sub-slab system w/in 4-8 weeks **B)** sample to confirm system is effective	WI DNR RR800 (2018), EPA Reg. V (2020)
g) TCE is present in indoor air at or above the applicable VAL	**A)** evaluate demographics in building **B)** consult w/ women 15-44 about TCE **C)** carbon filtration w/in 48 hours and sub-slab system w/in 2 weeks	WI DNR RR800 (2018), EPA Reg. V (2020)
h) Non-carcinogenic compounds are present in indoor air at or above three (3) times the applicable VAL	**A)** RfC is estimate, ca. order of magnitude, of concentration w/o harm over lifetime **B)** >3x that level cuts significantly into that safety factor **C)** sub-slab system w/in 4-8 weeks **D)** if >>VAL, consult health officer for actions available under Section 254 WI Administrative Code	WI DNR RR800 (2018), EPA Reg. V (2020)
i) Carcinogenic compounds are present in indoor air at or above ten (10)	**A)** VRSLs est. w/ 10^{-5} cancer risk **B)** >10x that exceeds 10^{-4} cancer risk **C)** sub-slab system w/in 4-8 weeks	WI DNR RR800 (2018), EPA Reg. V (2020)

times the applicable VAL	**D)** if >>VAL, consult health officer for actions available under Section 254 WI Administrative Code	
4) Health-based recommendations for when sampling indoor air at commercial or industrial businesses is necessary in light of the recent Department of Defense study on sewers and utility tunnels as preferential pathways (*Sewers and Utility Tunnels as Preferential Pathways for Volatile Organic Compound Migration into Buildings: Risk Factors And Investigation Protocol*, ESTCP Project ER-201505)	**A)** DHS agrees with DOD study findings **B)** DHS recommends sampling indoor air when soil gas results suggest indoor air levels may be exceeded **C)** Indoor air should always be assessed where TCE is contaminant of concern due to acute reproductive endpoint **D)** when assessing indoor air in commercial buildings, may need to relocate COCs that are used in production during sampling	US DOD ESTCP Project ER-201505 (2018)

Table of results for Wisconsin Departement of Health Services vapor sampling
AT-525 passive monitor data collected in April 2022 at 1422 N. Vel R. Phillips Avenue, Milwaukee.

Field #	Description	Benzene Result $\mu g/m^3$ Val = 16	TCE Result $\mu g/m^3$ Val = 8.8
PQ02561 OB5	Outside - Back 7 day	0.98	0.75
PQ05654 OB14	Outside - Back 14 day	0.83	2.0
PQ02817 OS5	Outside - Alley 7 day	0.95	**41**
PQ02574 OS14	Outside - Alley 14 day	0.95	**67**
PQ05017 100 A5	Basement by slot vents - 7 day	0.80	**29**
PQ02679 100 A14	Basement by slot vents - 14 day	0.60	**27**
PQ02593 100 B5	Basement further back - 7 day	0.80	**17**
PQ04904 100 B14	Basement further back - 14 day	0.64	**17**
PQ04784 101 A5	1st floor near entrance - 7 day	0.78	**16**
PQ05592 101 A14	1st floor near entrance - 14 day	0.59	**15**
PQ05606 101 B5	1st floor near keyboard - 7 day	0.77	**17**
PQ04917 101 B14	1st floor near keyboard - 14 day	0.57	**16**
PQ05775 102 A5	2nd floor near stairs - 7 day	0.81	**16**
PQ04469 102 A14	2nd floor near stairs - 14 day	0.64	**15**
PQ02578 102 B5	2nd floor further back - 7 day	0.82	**15**
PQ02507 102 B14	2nd floor further back - 14 day	0.61	**15**

Note: results listed in bold are above the WI DNR Vapor Action Level (VAL).

Vapor samples were analyzed at the Wisconsin Occupational Health Laboratory, Madison, Wisconsin.
Laboratory data sheets available upon request.

TCE in the Workplace

What is TCE?

Trichloroethylene, or TCE, is a human-made chemical with properties that make it useful in a number of industrial processes and consumer products. TCE is often used as a metal degreaser and in the production of refrigerant and other chemicals. It is found in a number of consumer products, including adhesives, lubricants, paints, varnishes, paint strippers, pesticides, and condenser coil cleaner. TCE is a popular chemical in the textile processing and dry cleaning industries for cleaning cotton, wool, and other fabrics.

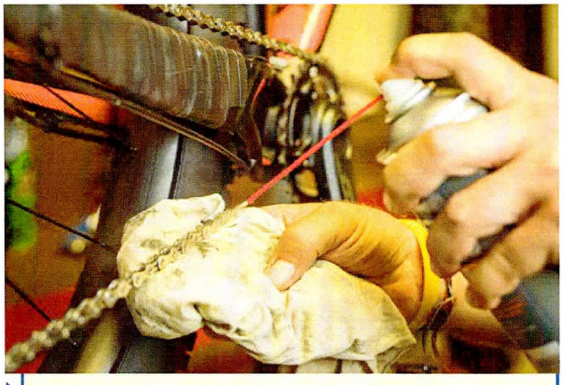
How are workers exposed to TCE?

TCE is a volatile chemical, which means that it can easily turn from liquid to vapor, which can be breathed in. The skin, eyes, and mouth can also absorb TCE after direct contact. TCE can present health risks to workers who handle the liquid or who breathe in TCE vapor without wearing proper safety gear.

How can TCE affect a worker's health?

Skin contact with high concentrations of TCE may cause skin irritation, such as a rash. Breathing in medium to high concentrations of TCE may cause headaches, dizziness, and sleepiness, while extremely high concentrations may cause coma and even death. Repeated exposures to TCE over long periods of time may cause cancer.[1]

While exposure to TCE can affect everyone, newer evidence shows that TCE exposure during pregnancy can have serious effects on the developing fetus, including an increased risk of heart defects. This can happen at low levels of TCE and very early in pregnancy, before someone may know that they are pregnant. Therefore, workplaces should take action to prevent harmful TCE exposures at all times, and especially for workers who are or may become pregnant.



TCE is a chlorinated solvent.

The chemical structure of TCE has chlorine atoms that help to dissolve organic materials like fats and greases. This makes it a useful chemical for removing grease from metal and stains from cloth, but also potentially harmful to human and environmental health.

Pregnant individuals should avoid exposure to TCE.

TCE can be especially harmful for the developing fetus—even when indoor air levels of TCE are low. At low levels, TCE has no odor to warn that contaminants are in the air.

Wisconsin Department of Health Services | Bureau of Environmental and Occupational Health
For more information on TCE and health, visit dhs.wi.gov and search "TCE."
P-03201
(02/2022)

What workplace guidelines are available for TCE?

The following workplace guidelines are available for TCE in air:

Year Issued	Issuing Institution or Agency	Guideline Type	Guideline
1978	National Institute for Occupational Safety and Health (NIOSH)[2]	Recommended exposure limit	25 ppm*
1989	Occupational Safety and Health Association (OSHA)[3]	Permissible exposure limit	100 ppm
2006	American Conference of Governmental Industrial Hygienists[3] (ACGIH)	8-hour time-weighted average	10 ppm
		Short-term exposure limit	25 ppm
2017	Wisconsin Department of Natural Resources (DNR)[4]‡	Vapor action level	1.6 ppbV†

*ppm = parts per million; †1.6 parts per billion by volume (ppbV) = 8.8 micrograms per cubic meter ($\mu g/m^3$)
‡ Wisconsin DHS recognizes recent research which demonstrates that much lower levels of TCE can be harmful to workers. Unlike older national guidelines, Wisconsin DNR's vapor action level for TCE takes newer evidence of fetal toxicity into consideration.

What are ways to keep workers safe?

Employers should minimize worker exposures to TCE and implement best management practices to reduce TCE in the workplace.

- Use alternative solvents that do not have the reproductive and carcinogenic risks of TCE.
- Store TCE in well-sealed containers in a designated chemical storage location that is away from air intakes for heating, ventilation, and cooling (HVAC) systems.
- Maintain HVAC systems and ensure adequate ventilation in critical areas where TCE is highly used, such as in pouring, mixing, or application settings.
- Develop and keep handy safety protocols to address TCE spills.
- Train workers who handle TCE directly in proper personal protective equipment (PPE) use and handling techniques.
- Monitor indoor air levels of TCE and strive to maintain them below Wisconsin's Vapor Action Levels[4] for small commercial and industrial workplace settings for the best worker protection.
- Educate workers, and especially those of childbearing age, on TCE health risks.
- Assign pregnant individuals to areas or job categories that do not involve direct handling of TCE. If an alternative job assignment is not possible, medically-cleared pregnant workers should wear respirators containing an organic vapor cartridge when directly handling TCE.

Contact us for help.

The Wisconsin Safety and Health Consultation Program provides free services to measure worker exposures and explore solvent alternatives. Call 800-947-0553 or visit http://slh.wisc.edu/wiscon for more information. DHS staff are also available to consult on this topic: Send an email to DHSEnvHealth@dhs.wi.gov.

References

1. ATSDR. Trichloroethylene - ToxFAQs. https://wwwn.cdc.gov/TSP/ToxFAQs/ToxFAQsDetails.aspx?faqid=172&toxid=30.
2. NIOSH. Pocket Guide to Chemical Hazards, Appendix C—Supplementary Exposure Limits. https://www.cdc.gov/niosh/npg/nengapdxc.html.
3. OSHA. OSHA Occupational Chemical Database—TRICHLOROETHYLENE. https://www.osha.gov/chemicaldata/684.
4. WI DNR. Guidance: Wisconsin Vapor Quick Look-Up Table, Indoor Air Vapor Action Levels and Vapor Risk Screening Levels.