



CHEMICAL UPDATE WORKSHEET

Chemical Name:	Diisopropyl ether (DD)
CAS #:	108-20-3
Revised By:	RRD Toxicology Unit
Revision Date:	September 24, 2015

(A) Chemical-Physical Properties

	Part 201 Value	Updated Value	Reference Source	Comments
Molecular Weight (g/mol)	102.18	102.18	EPI	EXP
Physical State at ambient temp	Liquid	Liquid	MDEQ	
Melting Point (°C)	-86.8	-86.80	EPI	EXP
Boiling Point (°C)	154	68.50	EPI	EXP
Solubility (ug/L)	8041	8.800E+06	EPI	EXP
Vapor Pressure (mmHg at 25°C)	146.8	1.49E+02	EPI	EXP
HLC (atm-m³/mol at 25°C)	1.3E-3	2.56E-03	EPI	EXP
Log Kow (log P; octanol-water)	1.67	1.52	EPI	EXP
Koc (organic carbon; L/Kg)	25.2	22.79	EPI	EST
Ionizing Koc (L/kg)		NR	NA	NA
Diffusivity in Air (Di; cm²/s)	0.08	6.54E-02	W9	EST
Diffusivity in Water (Dw; cm²/s)	8.0E-6	7.7582E-06	W9	EST
Soil Water Partition Coefficient (Kd; inorganics)	NR	NR	NA	NA

	Part 201 Value	Updated Value	Reference Source	Comments
Flash Point (°F)	-18	-28	CRC	EXP
Lower Explosivity Level (LEL; unit less)	0.014	0.014	CRC	EXP
Critical Temperature (K)		500.2	CRC	EXP
Enthalpy of Vaporization (cal/mol)		6.96E+03	CRC	EXP
Density (g/mL, g/cm ³)		0.7192	CRC	EXP
EMSOFT Flux Residential 2 m (mg/day/cm ²)	2.57E-05	2.76E-05	EMSOFT	EST
EMSOFT Flux Residential 5 m (mg/day/cm ²)	5.78E-05	6.59E-05	EMSOFT	EST
EMSOFT Flux Nonresidential 2 m (mg/day/cm ²)	3.62E-05	4.38E-05	EMSOFT	EST
EMSOFT Flux Nonresidential 5 m (mg/day/cm ²)	7.98E-05	1.03E-04	EMSOFT	EST

(B) Toxicity Values/Benchmarks

	Part 201 Value	Updated Value	Source/Reference/Date	Comments/Notes/Issues
Reference Dose (RfD) (mg/kg/day)	4.1E-3	2.7E-1	MDEQ, 2015	
RfD details	(Oral, SWQD): LD50 of 4100 mg/kg in rats. Acute-to-chronic application factor of 0.0001 (UF=100) (Kimura 1971). Source: MDEQ/RRD CCD date: 3/01/1985	<p>Tier 3 Source: MDEQ: Basis: Details on the RfD not currently available for New Jersey and ECHA. MDEQ is chosen for availability of details. See details below.</p> <p>Tier 1 and 2 Sources: IRIS: No IRIS file available at this time. PPRTV: Per PPRTV (4/21/2011), no value at this time. MRL: No MRL record available at this time.</p> <p>Tier 3 Sources: MDEQ: 1) Per DEQ-CCD/RRD (3/01/1985), RfD = 4.1E-3 mg/kg-day. See Part 201 Value RfD details. 2) Per DEQ-WRD, 11/24/2015, WRD derived an RfD = 2.7E-1 mg/kg-day based on inhalation data (an error was found in their previous route-to-route calculation and it was corrected by D. Bush). Critical Study: Dalbey, W. and M. Feuston. 1996. Sub chronic and developmental toxicity studies of vaporized diisopropyl ether in rats. J. Toxicol. Environ. Health. 49:29–43. Methods: two inhalation studies (sub chronic and developmental): In the sub chronic study, Sprague-Dawley rats (14/sex) were exposed to 0 (both untreated and sham-exposed controls), 480, 3300, or 7100 ppm vaporized diisopropyl ether for 6 h/d, 5 d/wk, for 90 days. In the developmental toxicity study, pregnant SD rats (22/group) were exposed to 0, 430, 3095, or 6745 ppm for 6 h/d on gestation days 6-15. Animals were sacrificed on GD 20. Critical effect: increased liver and kidney weights and rudimentary and short 14th ribs in fetal rats exposed during gestation. End point or Point of Departure (POD): NOAEL = 480 ppm (266 mg/kg-day)</p>		Complete



	Part 201 Value	Updated Value	Source/Reference/ Date	Comments/Notes /Issues
		<p>Uncertainty Factors: UF = 1,000 (10 each for interspecies variability, interspecies extrapolation and use of a sub chronic study) Source and date: MDEQ-WRD, 11/24/2015.</p> <p>New Jersey DEP: RfD= 2.5 mg/kg/day. (Details on the RfD must be requested from New Jersey. Due to the current schedule, this documentation was not pursued.)</p> <p>Texas CEQ: RfD= 1E-1 mg/kg/day Critical Study: Dalbey W, Feuston M. J. Toxicol. Environ. Health 1996 Sep; 49(1):29-43. Methods: Sub chronic and developmental toxicity studies of vaporized diisopropyl ether in rats. Two inhalation studies were performed with a vaporized sample of commercial-grade diisopropyl ether (DIPE).</p> <ul style="list-style-type: none"> • In the sub chronic study, Sprague-Dawley rats (14/sex) were exposed to 0 (both untreated and sham-exposed controls), 480, 3300, or 7100 ppm DIPE for 6 h/d, 5 d/wk, for approximately 90 days. DIPE itself accounted for 91-95% of the vapors, with the remainder being a mixture of 27-29 compounds. • In the developmental toxicity study, pregnant Sprague-Dawley rats (22/group) were exposed to 0 (both untreated and sham-exposed controls), 430, 3095, or 6745 ppm for 6 h/d on gestation days 6-15. Animals were sacrificed on gestation day 20. <p>Critical Effects: Exposure of males to 7100 ppm resulted in hypertrophy of liver cells associated with increased liver weight and in increased kidney weight with an increased incidence of hyaline droplets in proximal tubules of the kidney. Females had increased weight of both liver and kidney, although kidney increased only in relation to sham-exposed controls and no morphological changes were observed in either organ. At 3300 ppm, weights of liver and kidney were again increased in males; the liver weights were increased in females only compared to sham-exposed controls and not untreated controls. No abnormalities were observed morphologically. No changes were observed with 480 ppm. With 6745 ppm, dams had a slight reduction in body weight gain and a significant decrease in food consumption. A concentration-related increase in the incidence</p>		



	Part 201 Value	Updated Value	Source/Reference/Date	Comments/Notes/Issues
		<p>of rudimentary 14th ribs was observed, but its significance was uncertain. There was no apparent toxicity, either maternal or fetal, at the lowest exposure concentration.</p> <p>Point of Departure: NOAEL = 480 ppm = 2000 mg/m³; NOAEL_{ADJ} = 2000 mg/m³ x 6 hours/24 hours x 5 days/7 days = 357 mg/m³; NOAEL = 357 mg/m³ x 20 m³/day x 1/70 kg = 102 mg/kg-per day; NOAEL = 102 mg/kg per day. (102 ÷ 1000 = 1E-1 mg/kg/day).</p> <p>Uncertainty Factors: 1000: 10 each for inter- and intra-species variability and use of a sub chronic study.</p> <p>Source: Texas RfD justification for diisopropyl ether. Dated 6/1/2000.</p> <p>ECHA (REACH): RfD= 43.1 mg/kg/day (4.3E+1 mg/kg/day) based on a repeated dose study. No additional information available on-line.</p> <p>Other Tier 3: No value is available at this time from these Tier 3 sources/databases: HEAST, NTP ROC, health and environmental agencies of California, Massachusetts, Minnesota and New York, WHO (IARC), WHO (IPCS/INCHEM), Canada, The Netherlands (RIVM), and OECD HPV.</p>		
Oral Cancer Slope Factor (CSF) (mg/kg-day)⁻¹	--	NA	MDEQ, 2015	
CSF details	NA	<p>Tier 1 and 2 Sources:</p> <p>IRIS: No IRIS file available at this time.</p> <p>PPRTV: Per PPRTV (4/21/2011), no value at this time. The cancer assessment for DIPE is on hold until the completion of an EPA-NIEHS review of cancer data.</p> <p>MRL: NA; MRLs are for non-cancer effects only.</p> <p>Tier 3 Source:</p> <p>MDEQ: Per DEQ-CCD, no value at this time.</p>		Complete
Reference Concentration (RfC) or Initial Threshold	3.58E+2	7.0E+2	PPRTV, 2009	



	Part 201 Value	Updated Value	Source/Reference/Date	Comments/Notes/Issues
Screening Level (ITSL) ($\mu\text{g}/\text{m}^3$)				
RfC/ITSL details	<p>ITSL based on a NOAEL of 480 ppm (2006 mg/m³) from a 13-week rat inhalation study. In this study, Sprague-Dawley rats (14/sex) were exposed to 0, 480, 3300, or 7100 ppm DIPE for 6 h/d, 5 d/wk, for approximately 13 weeks. At 3300 ppm, weights of liver and kidney were increased in males and only liver weight increased in females compared to control. Exposure to males at 7100 ppm resulted in hypertrophy of liver cells and increased kidney weights, whereas, females exposed</p>	<p>Tier 2 Source: PPRTV: Basis: PPRTV is a Tier 2 value, Tier 1 not available. PPRTV (2011) chronic p-RfC = 0.7 mg/m³: Critical Study: Dalbey, W. and M. Feuston. 1996. Sub chronic and developmental toxicity studies of vaporized diisopropyl ether in rats. J. Toxicol. Environ. Health. 49:29–43. Methods: In the sub chronic study, Sprague-Dawley rats (14/sex/group) were whole-body exposed to 0 (untreated), 0 (sham-exposed), 2000, 13,800, or 29,700 mg/m³ (0, 480, 3300, or 7100 ppm) of DIPE 6 hours/day, 5 days/week, for approximately 13 weeks. In the developmental study, groups of 22 mated female Sprague-Dawley rats were whole-body exposed to 0 (untreated), 0 (sham-exposed), 1800, 12,940, or 28,200 mg/m³ (0, 430, 3095, or 6745 ppm) DIPE vapor for 6 hours/day on Days 6–16 of gestation. Critical effect: rudimentary and short 14th ribs in fetal rats exposed during gestation End point or Point of Departure (POD): BMCL_{HEC} = 66 mg/m³ Uncertainty Factors: UF = 100 (10 for interspecies variability and 3 each for interspecies extrapolation and database deficiencies; UF =1 for sub chronic to chronic) Source and date: PPRTV, 4/21/2011</p> <p>Tier 1 and 2 Sources: IRIS: No IRIS file available at this time. MRL: No MRL record available at this time.</p> <p>Tier 3 Source: MDEQ: Per DEQ-CCD/AQD, RfC = 3.58E+2 $\mu\text{g}/\text{m}^3$. See Part 201 Value RfC details. Averaging time = 24 hours.</p>		Complete



	Part 201 Value	Updated Value	Source/Reference/Date	Comments/Notes/Issues
	to 7100 ppm had increased liver and kidney weights with no morphological changes observed in either organ. No adverse effects on clinical signs, body weights, serum chemistry, hematology, or the number of sperm or spermatids were observed following exposure to 480 ppm DIPE. CCD/AQD date: 2/26/2001			
Inhalation Unit Risk Factor (IURF) (($\mu\text{g}/\text{m}^3$) ⁻¹)	--	NA	MDEQ, 2015	
IURF details	NA	<p>Tier 1 and 2 Sources: IRIS: No IRIS file available at this time. PPRTV: Per PPRTV (4/21/2011), no value at this time. The cancer assessment for DIPE is on hold until the completion of an EPA-NIEHS review of cancer data. MRL: NA; MRLs are for non-cancer effects only.</p> <p>Tier 3 Source: MDEQ: Per DEQ-CCD, no value at this time.</p>		Complete



	Part 201 Value	Updated Value	Source/Reference/Date	Comments/Notes/Issues
Mutagenic Mode of Action (MMOA)? (Y/N)	--	NO	USEPA, 2015	
MMOA Details	--	NA Not listed as a carcinogen with mutagenic MOA in the USEPA OSWER List.		
Developmental or Reproductive Effector? (Y/N)	No	YES- for both oral and inhalation, the RfC is based on a reproductive-developmental effect. The RfD is based on the same principal study used by EPA to derive the RfC. Oral Exposure Pathways- Single Exposure Inhalation Exposure Pathways- Single Exposure	MDEQ, 2015	
Developmental or Reproductive Toxicity Details	NA	<p>Critical effect: rudimentary and short 14th ribs in fetal rats exposed during gestation</p> <p>Critical Study: Dalbey, W. and M. Feuston. 1996. Sub chronic and developmental toxicity studies of vaporized diisopropyl ether in rats. J. Toxicol. Environ. Health. 49:29–43.</p> <p>Methods: In the sub chronic study, Sprague-Dawley rats (14/sex/group) were whole-body exposed to 0 (untreated), 0 (sham-exposed), 2000, 13,800, or 29,700 mg/m³ (0, 480, 3300, or 7100 ppm) of DIPE 6 hours/day, 5 days/week, for approximately 13 weeks. In the developmental study, groups of 22 mated female Sprague-Dawley rats were whole-body exposed to 0 (untreated), 0 (sham-exposed), 1800, 12,940, or 28,200 mg/m³ (0, 430, 3095, or 6745 ppm) DIPE vapor for 6 hours/day on Days 6–16 of gestation.</p>		
State Drinking Water Standard (SDWS) (ug/L)	--	NO	SDWA, 1976	
SDWS details	NA	MI Safe Drinking Water Act (SDWA) 1976 PA 399		
Secondary Maximum Contaminant Level (SMCL) (ug/L)	--	NO	SDWA, 1976 and USEPA SMCL List, 2015	
SMCL details	NA	NA		
Is there an aesthetic value for	NO	Not evaluated.	NA	



	Part 201 Value	Updated Value	Source/Reference/ Date	Comments/Notes /Issues
drinking water? (Y/N)				
Aesthetic value (ug/L)	NA	NA	NA	
Aesthetic Value details	NA	NA		
Phytotoxicity Value? (Y/N)	NO	Not evaluated.	NA	
Phytotoxicity details	NA	NA	NA	
Others				

(C) Chemical-specific Absorption Factors

	Part 201 Value	Update	Source/Reference/ Dates	Comments/Notes /Issues
Gastrointestinal absorption efficiency value (ABS _{gi})	---	1.0	MDEQ, 2015/ USEPA RAGS-E, 2004	
ABS _{gi} details		RAGS E (USEPA, 2004) Default Value		
Skin absorption efficiency value (AE _d)	---	0.1	MDEQ, 2015	
AE _d details				
Ingestion Absorption Efficiency (AE _i)		1.0	MDEQ, 2015	
AE _i Details				
Relative Source Contribution for Water (RSC _w)		0.2	MDEQ, 2015	
Relative Source Contribution for Soil (RSC _s)		1.0	MDEQ, 2015	
Relative Source Contribution for Air (RSC _a)		1.0	MDEQ, 2015	
Others				



(D) Rule 57 Water Quality Values and GSI Criteria

Current GSI value (µg/L)	ID
Updated GSI value (µg/L)	ID
Rule 57 Drinking Water Value (µg/L)	22,000

	Rule 57 Value (µg/L)	Verification Date
Human Non-cancer Values- Drinking water source (HNV-drink)	22,000	8/2000
Human Non-Cancer Values- Non-drinking water sources (HNV-Non-drink)	1,200,000	8/2000
Wildlife Value (WV)	NA	NA
Human Cancer Values for Drinking Water Source (HCV-drink)	NA	NA
Human Cancer values for non-drinking water source (HCV-Non-drink)	NA	NA
Final Chronic Value (FCV)	ID	8/2000
Aquatic maximum value (AMV)	ID	8/2000
Final Acute Value (FAV)	ID	8/2000

Sources:

1. MDEQ Surface Water Assessment Section Rule 57 [website](#)
2. MDEQ Rule 57 [table](#)



(E) Target Detection Limits (TDL)

	Value	Source
Target Detection Limit – Soil ($\mu\text{g}/\text{kg}$)	250	MDEQ, 2015
Target Detection Limit – Water ($\mu\text{g}/\text{L}$)	5	MDEQ, 2015
Target Detection Limit – Air (ppbv)	8.50E+01	MDEQ, 2015
Target Detection Limit – Soil Gas (ppbv)	2.80E+03	MDEQ, 2015

CHEMICAL UPDATE WORKSHEET ABBREVIATIONS:

CAS # - Chemical Abstract Service Number.

Section (A) Chemical-Physical Properties**Reference Source(s):**

CRC	Chemical Rubber Company Handbook of Chemistry and Physics, 95th edition, 2014-2015
EMSOFT	USEPA Exposure Model for Soil-Organic Fate and Transport (EMSOFT) (EPA, 2002)
EPA2001	USEPA (2001) Fact Sheet, Correcting the Henry's Law Constant for Soil Temperature. Office of Solid Waste and Emergency Response, Washington, D.C.
EPA4	USEPA (2004) User's Guide for Evaluating Subsurface Vapor Intrusion into Buildings. February 22, 2004.
EPI	USEPA's Estimation Programs Interface SUITE 4.1, Copyright 2000-2012
HSDB	Hazardous Substances Data Bank
MDEQ	Michigan Department of Environmental Quality
NPG	National Institute for Occupational Safety and Health Pocket Guide to Chemical Hazards
PC	National Center for Biotechnology Information's PubChem database
PP	Syracuse Research Corporation's PhysProp database
SCDM	USEPA's Superfund Chemical Data Matrix
SSG	USEPA's Soil Screening Guidance: Technical Background Document, Second Edition, 1996
USEPA/EPA	United States environmental protection agency's Risk Assessment Guidance for Superfund Volume I: Human Health Evaluation Manual (Part E, Supplemental Guidance for Dermal Risk Assessment). July, 2004.

W9 USEPA's User Guide for Water9 Software, Version 2.0.0, 2001

Basis/Comments:

EST	estimated
EXP	experimental
EXT	extrapolated
NA	not available or not applicable
NR	not relevant

Section (B) Toxicity Values/Benchmarks**Sources/References:**

ATSDR	Agency for Toxic Substances and Disease Registry
CALEPA	California Environmental Protection Agency
CAL DTSC	California Department of Toxic Substances Control
CAL OEHHA	CAEPA Office of Environmental Health Hazard Assessment
CCD	MDEQ Chemical Criteria Database
ECHA	European Chemicals Agency (REACH)
OECD HPV	Organization for Economic Cooperation and Development HPV Database
HEAST	USEPA's Health Effects Assessment Summary Tables
IRIS	USEPA's Integrated Risk Information System
MADEP	Massachusetts Department of Environmental Protection
MDEQ/DEQ	Michigan Department of Environmental Quality
DEQ-CCD/AQD	MDEQ Air Quality Division
DEQ-CCD/RRD	MDEQ Remediation and Redevelopment Division
DEQ-CCD/WRD	MDEQ Water Resources Division
MNDOH	Minnesota Department of Health

NJDEP	New Jersey Department of Environmental Protection
NYDEC	New York State Department of Environmental Conservation
OPP/OPPT	USEPA's Office of Pesticide Programs
PPRTV	USEPA's Provisional Peer Reviewed Toxicity Values
RIVM	The Netherlands National Institute of Public Health and the Environment
TCEQ	Texas Commission on Environmental Quality
USEPA	United States Environmental Protection Agency
USEPA OSWER	USEPA Office of Solid Waste and Emergency Response
USEPA MCL	USEPA Maximum Contaminant Level
WHO	World Health Organization
WHO IPCS	International Programme on Chemical Safety (IPCS/INCHEM)
WHO IARC	International Agency for Research on Cancers
NA	Not Available.
NR	Not Relevant.

Toxicity terms:

BMC	Benchmark concentration
BMCL	Lower bound confidence limit on the BMC
BMD	benchmark dose
BMDL	Lower bound confidence limit on the BMD
CSF	Cancer slope Factor
CNS	Central nervous system
IURF or IUR	Inhalation unit risk factor
LOAEL	Lowest observed adverse effect level
LOEL	Lowest observed effect level
MRL	Minimal risk level (ATSDR)
NOAEL	No observed adverse effect level
NOEL	No observed effect level

RfC	Reference concentration
RfD	Reference dose
p-RfD	Provisional RfD
aRfD	Acute RfD
UF	Uncertainty factor
WOE	Weight of evidence

Section (C) Chemical-specific Absorption Factors

MDEQ	Michigan Department of Environmental Quality
USEPA RAGS-E	United States Environmental Protection Agency's Risk Assessment Guidance for Superfund Volume I: Human Health Evaluation Manual (Part E, Supplemental Guidance for Dermal Risk Assessment). July, 2004.

Section (D) Rule 57 Water Quality Values and GSI Criteria

GSI	Groundwater-surface water interface
NA	A value is not available or not applicable.
ID	Insufficient data to derive value
NLS	No literature search has been conducted