



## CHEMICAL UPDATE WORKSHEET

<b>Chemical Name:</b>	<b>Iron</b>
<b>CAS #:</b>	<b>7439-89-6</b>
<b>Revised By:</b>	RRD Toxicology Unit
<b>Revision Date:</b>	August 18, 2015

### (A) Chemical-Physical Properties

	Part 201 Value	Updated Value	Reference Source	Comments
<b>Molecular Weight (g/mol)</b>	55.845	55.85	EPI	EXP
<b>Physical State at ambient temp</b>	Inorganic	Inorganic	MDEQ	
<b>Melting Point (°C)</b>	---	1538.00	CRC	EXP
<b>Boiling Point (°C)</b>	2750	2861.00	CRC	EXP
<b>Solubility (ug/L)</b>	NA	NA	NA	NA
<b>Vapor Pressure (mmHg at 25°C)</b>	NA	NR	NA	NA
<b>HLC (atm-m<sup>3</sup>/mol at 25°C)</b>	NR	NR	NA	NA
<b>Log Kow (log P; octanol-water)</b>	NR	NR	NA	NA
<b>Koc (organic carbon; L/Kg)</b>	NR	NR	NA	NA
<b>Ionizing Koc (L/kg)</b>		NR	NA	NA
<b>Diffusivity in Air (Di; cm<sup>2</sup>/s)</b>	NR	NR	NA	NA
<b>Diffusivity in Water (Dw; cm<sup>2</sup>/s)</b>	NR	NR	NA	NA
<b>Soil Water Partition Coefficient (Kd; inorganics)</b>	NA	NA	NA	NA

	Part 201 Value	Updated Value	Reference Source	Comments
Flash Point (°C)	NA	NA	NA	NA
Lower Explosivity Level (LEL; unitless)	NA	NA	NA	NA
Critical Temperature (K)		NR	NA	NA
Enthalpy of Vaporization (cal/mol)		NR	NA	NA
Density (g/mL, g/cm <sup>3</sup> )		NR	NA	NA
EMSOFT Flux Residential 2 m (mg/day/cm <sup>2</sup> )	NA	NR	EMSOFT	NA
EMSOFT Flux Residential 5 m (mg/day/cm <sup>2</sup> )	NA	NR	EMSOFT	NA
EMSOFT Flux Nonresidential 2 m (mg/day/cm <sup>2</sup> )	NA	NR	EMSOFT	NA
EMSOFT Flux Nonresidential 5 m (mg/day/cm <sup>2</sup> )	NA	NR	EMSOFT	NA

**(B) Toxicity Values/Benchmarks**

	Part 201 Value	Updated Value	Source/Reference/ Date	Comments/Notes /Issues
Reference Dose (RfD) (mg/kg/day)	--	0.7	PPRTV, 2006	
RfD details	NA	<p><b>Tier 2 Source</b>  <b>PPRTV:</b>  <b>Basis:</b> PPRTV is a Tier 2 source, no Tier 1 available  <b>PPRTV (2006):</b> provisional chronic RfD = 7E-1 mg/kg/d.  <b>Critical Study:</b> Frykman, E. et al., And (1994) Side effects of iron supplements in blood donors: Superior tolerance of heme iron. J Lab Clin Med. 123(4):561-4.  <b>Method(s):</b> Frykman et al. is a placebo-controlled, cross-over design study conducted in Swedish men and women. Ferrous fumarate (60 mg elemental iron/day) was administered for one month.  <b>Critical effect:</b> Gastrointestinal toxicity; a significant increase in gastrointestinal effects was seen compared to the placebo.  <b>End point or Point of Departure (POD):</b> To determine the LOAEL for total daily iron intake, the LOAEL for daily supplementation with ferrous fumarate of 60 mg elemental iron/day was added to the estimated mean dietary intake for six European countries of 11 mg elemental iron/day (NAS, 2001) for a total daily iron intake of 71 mg elemental iron/day. Based on a reference body weight of 70 kg, the LOAEL is 1 mg/kg/d. This LOAEL is considered to be a minimal LOAEL because gastrointestinal effects were characterized by most study participants as minor in severity.  <b>Uncertainty Factors:</b> UF = 1.5. A UF of 1.5 was applied to account for extrapolation from a minimal LOAEL to a NOAEL for a non-serious effect i.e., the observed effects are not considered serious and are reversible when exposure is discontinued.  <b>Source and date:</b> PPRTV for Iron and Compounds September 2006.</p> <p><b>Tier 1 and 2 Sources:</b>  <b>IRIS:</b> No IRIS file available at this time.  <b>MRL:</b> No MRL record is available for iron at this time  <b>PPRTV:</b> See above.</p>		Complete

	Part 201 Value	Updated Value	Source/Reference/ Date	Comments/Notes /Issues
		<b>Tier 3 Source:</b> <b>MDEQ-RRD:</b> Per DEQ-CCD, an RfD of 0.3 mg/kg-day was developed in 1993 as a provisional value from EPA's Superfund Health Risk Technical Support Center and based on a NOEL (0.27 mg/kg/d) for chronic iron overload using values for dietary intake and iron status indices taken from NHANES II. Intake levels of 0.15-0.27 mg/kg/d are both sufficient to protect against iron deficiency and insufficient to cause the toxic effects of iron overload.		
<b>Oral Cancer Slope Factor (CSF) (mg/kg-day)<sup>-1</sup></b>	--	NA	MDEQ, 2015	
<b>CSF details</b>	NA	<b>Tier 1 and 2 Sources:</b> <b>IRIS:</b> No IRIS file available at this time. <b>PPRTV:</b> Per PPRTV dated September 2006, no value at this time. <b>MRL:</b> NA; MRLs are for non-cancer effects only.  <b>Tier 3 Source:</b> <b>MDEQ:</b> Per DEQ-CCD, no value at this time.		Complete
<b>Reference Concentration (RfC) or Initial Threshold Screening Level (ITSL) (µg/m<sup>3</sup>)</b>	--	NA	MDEQ, 2015	
<b>RfC/ITSL details</b>	NA	<b>Tier 1 and 2 Sources:</b> <b>IRIS:</b> No IRIS file available at this time. [OR] Per IRIS (date), no value at this time. <b>PPRTV:</b> Per PPRTV dated September 2006, no value at this time. <b>MRL:</b> No MRL record available at this time.  <b>Tier 3 Source:</b> <b>MDEQ-AQD:</b> Per DEQ-CCD, no ITSL value available at this time.		Complete
<b>Inhalation Unit Risk Factor (IURF) ((µg/m<sup>3</sup>)<sup>-1</sup>)</b>	--	NA	MDEQ, 2015	

	Part 201 Value	Updated Value	Source/Reference/ Date	Comments/Notes /Issues
<b>IURF details</b>	NA	<b>Tier 1 and 2 Sources:</b> <b>IRIS:</b> No IRIS file available at this time. <b>PPRTV:</b> Per PPRTV (9/2006), no value at this time. <b>MRL:</b> NA; MRLs are for non-cancer effects only.  <b>Tier 3 Source:</b> <b>MDEQ-AQD:</b> Per DEQ-CCD, no IURF value available at this time.		Complete
<b>Mutagenic Mode of Action (MMAA)? (Y/N)</b>	--	No	USEPA, 2015	
<b>MMAA Details</b>	--	Not listed as a carcinogen with mutagenic MOA in the USEPA OSWER List.		
<b>Developmental or Reproductive Effector? (Y/N)</b>	No	No, the RfD is not based on a reproductive-developmental effect.	MDEQ, 2015	
<b>Developmental or Reproductive Toxicity Details</b>	NA	NA		
<b>State Drinking Water Standard (SDWS) (ug/L)</b>	--	NO	SDWA, 1976	
<b>SDWS details</b>	NA	MI Safe Drinking Water Act (SDWA) 1976 PA 399		
<b>Secondary Maximum Contaminant Level (SMCL) (ug/L)</b>	--	300	SDWA, 1976 and USEPA SMCL List	
<b>SMCL details</b>	NA	Noticeable effects above the SMCL are a rusty color; sediment; metallic taste; reddish or orange staining.		
<b>Is there an aesthetic value for drinking water? (Y/N)</b>	NO	Not evaluated.	NA	
<b>Aesthetic value (ug/L)</b>	NA	NA	NA	

	Part 201 Value	Updated Value	Source/Reference/ Date	Comments/Notes /Issues
<b>Aesthetic Value details</b>	NA	NA		
<b>Phytotoxicity Value? (Y/N)</b>	NO	Not evaluated.	NA	
<b>Phytotoxicity details</b>	NA	NA	NA	
<b>Others</b>				

**(C) Chemical-specific Absorption Factors**

	Part 201 Value	Update	Source/Reference/ Dates	Comments/Notes /Issues
Gastrointestinal absorption efficiency value (ABS <sub>gi</sub> )	---	1.0	MDEQ, 2015/USEPA RAGS-E, 2004	
ABS <sub>gi</sub> details		RAGS E (USEPA, 2004) Default Value		
Skin absorption efficiency value (AE <sub>d</sub> )	---	0.01	MDEQ, 2015	
AE <sub>d</sub> details				
Ingestion Absorption Efficiency (AE <sub>i</sub> )		0.5	MDEQ, 2015	
AE <sub>i</sub> Details				
Relative Source Contribution for Water (RSC <sub>w</sub> )		0.2	MDEQ, 2015	
Relative Source Contribution for Soil (RSC <sub>s</sub> )		1.0	MDEQ, 2015	
Relative Source Contribution for Air (RSC <sub>A</sub> )		1.0	MDEQ, 2015	
Others				

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

<b>Current GSI value (µg/L)</b>	NA
<b>Updated GSI value (µg/L)</b>	(EE)
<b>Rule 57 Drinking Water Value (µg/L)</b>	NA

	<b>Rule 57 Value (µg/L)</b>	<b>Verification Date</b>
<b>Human Non-cancer Values- Drinking water source (HNV-drink)</b>		
<b>Human Non-Cancer Values- Non-drinking water sources (HNV-Non-drink)</b>		
<b>Wildlife Value (WV)</b>		
<b>Human Cancer Values for Drinking Water Source (HCV-drink)</b>		
<b>Human Cancer values for non-drinking water source (HCV-Non-drink)</b>		
<b>Final Chronic Value (FCV)</b>		
<b>Aquatic maximum value (AMV)</b>		
<b>Final Acute Value (FAV)</b>		

Sources:

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



**(E) Target Detection Limits (TDL)**

	<b>Value</b>	<b>Source</b>
<b>Target Detection Limit – Soil (<math>\mu\text{g}/\text{kg}</math>)</b>	5,000	MDEQ, 2015
<b>Target Detection Limit – Water (<math>\mu\text{g}/\text{L}</math>)</b>	200	MDEQ, 2015
<b>Target Detection Limit – Air (ppbv)</b>	NA	MDEQ, 2015
<b>Target Detection Limit – Soil Gas (ppbv)</b>	NA	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