REDSHIFT TECHNOLOGIES, INC.

DRAFT
MATERIAL SAFETY DATA SHEET

SECTION 1 - PRODUCT & COMPANY IDENTIFICATION

Redshift Technologies, Inc.
34 East 29th Street
New York, NY 10016

Emergency telephone number (Chemtrec): (800) 424-9300

Product name	Methylene Chloride
Synonyms	Dichloromethane; Methylene Bichloride; Methylene Dichloride
Chemical family	Halogenated, aliphatic
Description	Colorless liquid with characteristic sweet, pleasant odor, like chloroform
Chemical name	Methylene Chloride
CAS number	75-09-2
RTECS number	NIOSH/PA8050000
EINECS number	200-838-9

SECTION 2 - COMPOSITION

Ingredient	CAS Number	Amount
Methylene chloride*	75-09-2	100%

*Hazardous

Note: Ingredient(s) indicated as hazardous have been assessed under US OSHA Hazard Communication Standard for workplace safety (29 CFR 1910.1200).

SECTION 3 - HAZARDS IDENTIFICATION

Signal word	**WARNING!**
Statements of hazard	**POSSIBLE CANCER HAZARD (BASED ON ANIMAL DATA). CAN CAUSE EYE, SKIN, AND RESPIRATORY TRACT IRRITATION. CAN CAUSE CENTRAL NERVOUS SYSTEM AND RESPIRATORY TRACT EFFECTS, LIVER CHANGES AND BLOOD DISORDER.**
Eye effects	Can cause eye irritation (based on animal data).
Short term	Irritation can occur following direct contact, based on animal studies. Symptoms might include redness, swelling, blurred vision, or pain.
Long term	Repeated or prolonged contact may cause conjunctivitis (inflammation of the mucous membrane covering the eye).
Skin effects	Can cause skin irritation (based on animal data).

SECTION 3 - HAZARDS IDENTIFICATION …continued

Short term	Irritation can occur following direct contact, based on animal studies. Symptoms might include effects ranging from mild irritation to severe pain, numbness, tingling, and possibly burns.
Long term	Repeated or prolonged skin contact may cause dryness and fissuring (cracking of the skin) due to defatting action of liquid on skin.
Inhalation effects	Can cause nose, throat and lung irritation.
Short term	Inhalation of vapors can cause irritation of the upper respiratory tract. Symptoms include irritation, nausea, dizziness, numbness of the extremities, a sensation of heat, drunkenness, irregular heartbeat, headache, stupor, dullness, lung congestion, blood disorders, and mental confusion.
Long term	Repeated or prolonged inhalation can cause chest pain, central nervous system depression, liver damage, blood disorder, cardiac arrhythmia, reproductive effects, effects on the brain, and cancer.
Ingestion effects	Single dose oral toxicity is low, however, ingestion of this substance will irritate the mouth and throat and may cause systemic effects as described above under "Inhalation effects".
Known clinical effects	Skin, eye, and nasal irritation; dermatitis; skin burns from prolonged contact; nasal congestion; anesthetic effects such as paresthesias of the extremities; narcosis; drunkenness, loss of coordination and equilibrium; headache; dizziness; giddiness; stupor; fatigue; nausea; depression; pulmonary edema; accelerated pulse; liver and kidney damage; and possible loss of consciousness and death.
Other potential health effects	Alcohol may enhance the toxic effects of this substance. May cross the placenta. May be excreted in breast milk. Women of childbearing potential or nursing mothers should exercise caution regarding exposure.
Route of entry	Inhalation, skin contact, or ingestion. This substance can be absorbed through intact or abraded skin causing systemic effects.

SECTION 4 - FIRST AID MEASURES

Eyes	Immediately flush eyes with water for at least 15 minutes. If irritation occurs or persists, get medical attention.
Skin	Remove contaminated clothing and wash affected skin with soap and water. If irritation occurs or persists, get medical attention.
Inhalation over time	Remove to fresh air. If not breathing, give artificial respiration. Get medical attention immediately.
Ingestion	If swallowed, get medical attention. Never give anything by mouth to an unconscious person. Do not induce vomiting unless directed by medical personnel.
Antidote	No specific antidote is recommended. Treat symptomatically and supportively.

SECTION 5 - FIRE FIGHTING MEASURES

General hazard	Toxic or corrosive emissions may be given off in a fire. See Hazardous combustion products, below.
Fire fighting instructions	Wear approved positive pressure, self-contained breathing apparatus and full protective turn out gear. Evacuate personnel to an area upwind to avoid smoke and vapors. Use water spray to keep fire-exposed containers cool.
Extinguishing media	Use water, carbon dioxide, foam or dry chemical extinguishers.
Hazardous combustion products	Emits toxic fumes of carbon monoxide, carbon dioxide, oxides of nitrogen, hydrogen chloride and other chlorine-containing compounds.
Flash point	No data available
Autoignition	556° C
PPE for fire fighting	Self-contained breathing apparatus and full protective equipment are recommended for firefighters.
Minimum explosive concentration for dust/ vapor	Not applicable (N/A)
Flammability limits	Lower 13% Upper 23%

SECTION 6 - ACCIDENTAL RELEASE MEASURES

General	Review Sections 3, 8 and 12 before proceeding with clean up. Avoid inhalation and direct contact. Wear appropriate personal protective equipment during all clean-up activities. Eliminate possible ignition sources (e.g., heat, sparks, flame, impact, friction, electricity), and follow appropriate grounding and bonding procedures.
Small spill	Contain the source of the spill or leak if possible without personal risk. Absorb spills with non-combustible absorbent material and transfer into a labeled container for disposal. Clean spill area thoroughly. Prevent discharge to drains.
Large spill	Dike, pump, or use non-combustible material to absorb spill; then place in a suitable, labeled recovery container. Close container and move it to a secure holding area. Clean spill area thoroughly. Use appropriate containment to avoid environmental contamination. Prevent entry into drains, sewers, and waterways.
Reportable quantity	The Superfund reportable quantity is 1,000 lbs.
Soil release	Dig a holding area such as lagoon, pit, soak hole or pond to contain liquid or solid material. Dike surface flow using soil, sand bags, foamed polyurethane, or foamed concrete. Absorb bulk liquid with fly ash, cement powder, or commercial sorbents. Control runoff and isolate discharged material for proper disposal.
Air release	Apply water spray or mist to knock down vapors.

SECTION 6 - ACCIDENTAL RELEASE MEASURES …continued

Water release

Use natural deep water pockets, excavated lagoon, or sand bag barriers to trap material at bottom. Remove trapped material with suction hoses. Prevent entry into waterways and sewers.

Treatment & disposal

As a general technique, treatment with sodium dichromate in strong sulfuric acid can be used. Carcinogens that are easily oxidizable can be destroyed with milder oxidative agents, such as saturated solution of potassium permanganate in acetone, which appear to be a suitable agent for destruction of hydrazines or of compounds containing isolated carbon-carbon double bonds. Concentrated or 50% aqueous sodium hypochlorite can also be used as an oxidizing agent.

SECTION 7 - HANDLING AND STORAGE

General handling

Eliminate possible ignition sources (e.g., heat, sparks, flame, impact, friction, electricity), and follow appropriate grounding and bonding procedures. Avoid breathing vapor or mist.

Storage conditions

Store out of direct sunlight in a cool, well ventilated dry area.

Temperature range for storage

15 - 25° C

SECTION 8 - EXPOSURE CONTROLS/PERSONAL PROTECTION

Exposure limits

Compound	Issuer	Type	OEL
Methylene chloride	ACGIH	TWA-8 HR	174 mg/m³
	ACGIH	TWA-8 HR	50 ppm
	OSHA	TWA-8 HR	25 ppm
	OSHA	Ceiling	125 ppm

Analytical method

EPA Method 601 & 624; NIOSH III #1005

Ventilation

Use process enclosures, local exhaust ventilation, or other engineering controls to maintain airborne levels below recommended exposure limits.

Eye protection

Wear splash goggles with a face shield. An eye wash station should be available.

Skin protection

Wear appropriate chemical protective clothing and boots. Wash hands and arms thoroughly after handling this material. Wash contaminated clothing before reuse or use disposable clothing.

Hand protection

Wear impervious gloves when handling this material.

Respiratory protection

If the applicable Occupational Exposure Limit (OEL) is exceeded, wear an appropriate respirator with a protection factor sufficient to control exposures to below the OEL.

SECTION 9 - PHYSICAL AND CHEMICAL PROPERTIES

Physical form	Liquid
Color	Colorless
Clarity	Clear
Odor	Characteristic sweet, pleasant odor, like chloroform
Taste	None known
Molecular weight	84.93
Molecular formula	CH_2Cl_2
pH	No data available
Boiling point	39.75° C
Melting point	-95° C
Density	2.93
Specific gravity	1.326 @ 20/4° C
Vapor pressure	340 mm Hg @ 20° C
Kinematic viscosity	0.43 mPa.s @ 20° C
Water solubility	10-50 mg/mL @ 21° C
Solvent solubility	Miscible with alcohol, ether, dimethylformamide. Completely miscible in most organic solvents. Miscible with ethanol and ethyl ether. Soluble in carbon tetrachloride.

SECTION 10 - STABILITY AND REACTIVITY

Stability	Stable
Conditions to avoid	Heat, moisture, and light
Reactivity	This substance reacts vigorously with active metals such as lithium, sodium, and potassium. This substance reacts vigorously with strong bases such as potassium tetrbutoxide.
Incompatibilities	Strong oxidizers, strong caustics and chemically active metals such as aluminum or magnesium powder. Alkali metals, amines, zinc and alloys of aluminum, magnesium and zinc.
Hazardous decomposition products	This substance decomposes by contact with hot surfaces and open flames. When heated to decomposition it emits highly toxic fumes of phosgene and hydrogen chloride.
Hazardous polymerization	Will not occur

SECTION 10 - STABILITY AND REACTIVITY…continued

Oxidizing properties No data available

Explosive properties This substance will not form explosive mixtures with air at ordinary temperatures. This substance is liable to explode when mixed with dinitrogen pentoxide or nitric acid. This substance will form explosive mixtures with an atmosphere having a high oxygen content, in liquid oxygen, nitrogen tetroxide, potassium, sodium, sodium- potassium alloy.

Explosive limits Lower 15.5% in oxygen
Upper 66.4% in oxygen

SECTION 11 - TOXICOLOGY INFORMATION

Acute toxicity

Compound	Type	Route	Species	Dosage
Methylene chloride	LD_{50}	Oral	Rat	1,600 mg/kg
	LD_{50}	IP	Rat	916 mg/kg
	LD_{50}	IP	Mice	437 mg/kg
	LC_{50}	Inhalation	Mice	16,000 ppm/7hr
	LC_{50}	Inhalation	Rat	52 g/m³

Eye A single application of 0.1 or 0.01 mL of methylene chloride into rabbits' eyes caused persistent lacrimation, inflammation of lids and conjunctiva, conjunctival edema, sloughing and increased intraocular pressure, and inflammation of the iris and cornea. Rabbits exposed to methylene chloride vapors at concentrations of 1,750 and 17,500 mg/m^3 (504 and 5,040 ppm) showed an increased corneal thickness.

Skin Methylene chloride caused severe to moderate irritation to rabbit skin at a dose level of 810 or 100 mg/24 hr, respectively. Methylene chloride can be absorbed through intact or abraded skin in toxic amounts.

Inhalation The inhalation LC_{50} of methylene chloride is reported to be 16,000 ppm/7hr in mice and 52 mg/m^3 in rats. Signs of toxicity are primarily associated with the central nervous system, and the liver. Other organs affected were the kidneys and respiratory system. Methylene chloride was evaluated for acute inhalation toxicity in the lung and liver of male mice and rats at atmospheric concentration levels of 2,000 and 4,000 ppm. In both mice and rats, signs of mild anesthesia characterized the overt toxicity to 4,000 ppm exposures. In mice, exposures to 2,000 and 4,000 ppm induced highly specialized changes in the lung and liver cells. No compound-related changes were noted in either lung or liver of the rat.

Ingestion The oral LD_{50} of methylene chloride in rats is reported to be 1,600 mg/kg. This indicates that methylene chloride is moderately toxic by ingestion. Target organs affected are central nervous system, liver, kidney, and respiratory system.

Mutagenicity	Methylene chloride is consistently mutagenic in microorganisms. Weaker and less consistent responses are seen in mammalian systems, predominantly in mice, both *in vitro* and *in viv*o. It induced sister chromatid exchanges, chromosome breakage and chromosome loss *in vitro* in human cells. *In vitro* results in rodent cells were inconclusive or negative. Methylene chloride induced DNA single-strand breaks in mammalian cell cultures, but inconclusive or negative effects were reported for induction of gene mutations. It did not induce unscheduled DNA synthesis either *in vivo* in rodents or in human fibroblast cultures. It was genotoxic in fungi but not in *Drosophila* in the sex-linked recessive lethal assay.
Skin irritation	810 mg/24 hr rabbit - skin; severe 100 mg/24 hr rabbit - skin; moderate
Skin sensitization	No data available.
Eye irritation	162 mg rabbit - eyes; moderate 10 mg rabbit - eyes; mild 500 mg/24 hr rabbit - eyes; mild
Subchronic effects	In single dose studies in mice and rats, methylene chloride was administered intraperitoneally at a dose level of 300, 550, and 1,000 mg/kg. Signs of toxicity included central nervous system depression and death. In dogs, methylene chloride was given by gavage at a dose level of 50, 100, 200, 400, and 600 mg/kg. Central nervous system depression was also observed at 400 and 600 mg/kg of methylene chloride. A percutaneous study to evaluate the absorption of methylene chloride was conduct with rabbits at a dose level of 15, 50, 100, 200 or 500 mg/kg. At each dose level, 4 rabbits (2 intact skin and 2 abraded skin) were treated for 8 hrs/day, 5 days/week, for 90 days. No signs of toxicity due to methylene chloride treatment were seen. Methylene chloride was given by gavage to rats at a dose level of 5 to 500 mg/kg/day for 2 to 12 weeks. Signs of toxicity observed in these studies included CNS depression, increased liver weight at > 100 mg/kg, centrilobular enlargement at 300 and 500 mg/kg, mycocarditis at < 10 mg/kg and deaths occurred at 300 and 500 mg/kg/day. Similar studies in dogs at the same dose levels and period showed microscopic liver and kidney changes (at all doses), decreased food consumption, body weight loss, and hypothermia.
Chronic toxicity	See Chronic effects/Carcinogenicity below.
Chronic effects/ carcinogenicity	Chronic toxicity and carcinogenicity of methylene chloride were evaluated in mice orally in drinking water at a dose level of 60, 125, 185, and 250 mg/kg/day for 24 months. There were no significant differences between treated animals and controls. The only significant sign of toxicity was a treatment related changes in both male and female liver at the highest dose. In this study, the toxicological no observable effect level of methylene chloride was 185 mg/kg/day in both sexes. Long-term chronic toxicity and carcinogenicity studies of methylene chloride were conducted by inhalation exposure in rats and mice 6 hr/day, 5 days/week at a dose level of 1,000, 2,000, or 4,000 ppm and 2,000 or 4,000 ppm for 102 weeks, respectively. In mice, increased incidences of benign and malignant lung and liver tumors were observed in both sexes. In rats, the incidence of benign mammary gland tumors was increased in males and females. It was associated with increased

Chronic effects/ carcinogenicity…continued	incidences of liver changes and bile duct fibrosis in both male and female rats. There also was a positive but marginal trend in the incidence of liver neoplastic nodules or carcinomas (combined) in female rats. In another long term study, rats and hamsters were exposed to methylene chloride by inhalation at a dose level of 500, 1,500, or 3,500 ppm for 6 hr/day, 5 days/week for 2 years. No cytogenetic effects were present at all dose levels in male or female rats. An increased mortality rate in female rats was observed at 3,500 ppm while female hamsters exposed to 1,500 or 3,500 ppm had decreased mortality rates. Minimal histopathologic effects were observed in the livers of rats at all dose levels. The total number of benign mammary gland tumors was increased in female rats in an exposure-related manner. This effect was also evident in male rats in the 1,500 and 3,500 ppm exposure groups. Male rats exposed to 1,500 or 3,500 ppm had an increased number of sarcomas located in or around the salivary glands. Hamsters exposed to the same concentration had less extensive spontaneous geriatric changes, decreased mortality (females), and lacked evidence of definite target organ toxicity. Under the conditions of the inhalation studies, there was some evidence of carcinogenicity of methylene chloride for male rats as shown by an increased incidence of benign neoplasms of the mammary gland. There was clear evidence of carcinogenicity for female rats as shown by increased incidences of benign neoplasms of the mammary gland. There was clear evidence of carcinogenicity for male and female mice, as shown by increased incidences of alveolar/bronchiolar neoplasms and liver neoplasms.
OSHA carcinogen	Yes
NTP carcinogen	Group 2 "Substances Reasonably anticipated to be a human carcinogen"
IARC carcinogen	Group 2B "Agents that are Possibly Carcinogenic to Humans"
Reproductive effects	See teratogenicity, below.
Teratogenicity	Pregnant mice and rats were exposed to methylene chloride vapors at a dose level of 1,250 ppm (4.4 g/m^3) for 7 hours daily on days 6 to 15 of gestation. No effects were observed on the number of implantation sites, litter size, incidence of fetal resorptions, fetal sex ratios or fetal body measurements. Methylene chloride was slightly fetotoxic to rats exposed by inhalation to 4,500 ppm for 6 hrs/day before and during the first 17 day of gestation; fetal weight reduction occurred but no malformation increase was found.
Target organs	Central nervous system; Liver; Lungs; Kidneys
At increased risk from exposure	Individuals with liver and/or kidney dysfunction or impairment, blood system disorder, and heart or cardiovascular system disorder may be more susceptible to toxicity in cases of overexposure.

SECTION 12 - ECOLOGICAL INFORMATION

Environmental overview

In the environment, this substance is not expected to leach through the soil or the sediment.This substance is relatively non-persistent in the environment. This substance is harmful to aquatic life. This substance if released into water, it is not expected to adsorb to suspended solids and sediments. Volatilization from water surfaces is expected.

Mobility, persistence, and degradability

This substance is expected to have very high mobility in soil. This substance is adsorbed strongly to peat moss, less strongly to clay, only slightly to dolomite limestone, and not at all to sand. Biodegradation in soil may occur based on activated sludge studies. This substance is non-persistent in the environment.

Bioaccumulation and toxicity

This substance potential of bioaccumulation in aquatic organisms is low. No toxicity to aquatic organisms is expected.

Aquatic toxicity

Compound	Type	Species	Dosage
Methylene chloride	LC_{50}/96h	Fathead minnow	193 mg/L
	EC_{50}/48h	Daphnia magna	1,682 mg/L
	EC_{50}/96h	Skeletonema costatum (Diatom)	> 662 mg/L
	EC_{50}/8h	Bullfrog	17,780 µg/L

Log P (octanol/water partition coefficient)

1.25

SECTION 13 - DISPOSAL INFORMATION

Disposal procedure

Treatment, storage, transportation and disposal must be in accordance with applicable Federal, State, and Local regulations. Incineration is the recommended method of disposal for this material. Do not dispose of even small amounts in the sanitary sewer, stormwater sewer, lakes, streams, or ponds.

SECTION 14 - TRANSPORTATION INFORMATION

Proper shipping name

Toxic/poison (methylene chloride)

General shipping instructions

Passenger Aircraft or Railcar: 605
Cargo Aircraft only: 612

UN number

1593

Hazard class

6.1

Packing group

III

U.S. DOT name

Dichloromethane (methylene chloride)

U.S. DOT UN No

UN1593

U.S. DOT hazard class

6.1

SECTION 14 - TRANSPORTATION INFORMATION…continued

U.S. DOT packing group	III
U.S. DOT packaging authorizations	Exceptions: 49 CFR 173.153 Non-Bulk Packaging: 49 CFR 173.203 Bulk Packaging: 49 CFR 173.241
U.S. DOT quantity limitations	Passenger Aircraft or Railcar: 60 L Cargo Aircraft only: 220 L
U.S. DOT labeling requirements	Toxic/poison
IATA name	Dichloromethane
IATA UN No	1593
IATA hazard class	6.1
IATA packing group	III
IMDG name	Dichloromethane
IMDG UN No	1593
IMDG hazard class	6.1
IMDG packing group	III
IMDG MFAG table number	340
IMDG EMS number	6.1-02
IMDG marine pollutant	No

SECTION 15 - REGULATORY INFORMATION

EU classification	Carcinogen; Category 2
EU labelling	**T**
Risk phrases	R49 - May cause cancer by inhalation.
Safety phrases	S2 - Keep out of reach of children. S23 - Do not breathe gas/fumes/vapor/spray. S24/25 - Avoid contact with eyes and skin. S36/37 - Wear suitable protective clothing and gloves.
RTECS number	NIOSH/PA8050000
TSCA status	Yes
SARA section 302	No
SARA section 313	Yes

SECTION 15 - REGULATORY INFORMATION …continued

WHMIS classification	Class D, Division 1, Subdivision B Class D, Division 2, Subdivision A Class D, Division 2, Subdivision B
California proposition 65	Listed
EU label pictogram(s)	

SECTION 16 - OTHER

Sources of data	The data contained in this MSDS may have been gathered from confidential internal sources, raw material suppliers, or from the published literature.
Disclaimer	**Redshift Technologies Inc. believes that the information contained in this Material Safety Data Sheet is accurate, and while it is provided in good faith, it is without a warranty of any kind, expressed or implied.**