MATERIAL SAFETY DATA SHEET

Information on the product and the manufacturer

Company	: KANTO DENKA KOGYO CO., LTD.
Address	: Waterras Annex, 2-105, Kanda-Awajicho, Chiyoda-ku, Tokyo, Japan
Department in Charge	: Sec.-I, Production Dept.-I, Mizushima Plant, KANTO DENKA KOGYO CO., LTD.
Person in charge (Producer):	Production Dept.-I General Manager, Mizushima Plant
Phone No.	: 81-86-455-5231
Fax No.	: 81-86-456-0136
Contact in an emergency	: Environment & Safety Dept., Mizushima Plant, KANTO DENKA KOGYO CO., LTD.
Phone No.	: 81-86-455-5231
Recommended applications and restrictions on use:	
	Degreasing and cleaning of metal processing components, manufacturing ingredient of chemical products, solvent for oils and fats, resins, rubber, and paints, extracting solvent, various polymer degree of polymerization adjusting agent, research and experimental reagent chemical, etc.
MSDS No. M-008E Date of preparation	: March 31, 1993
Date of revision	: April 22, 2013

Product name (chemical name, commercial name, etc.): Trichloroethylene

Hazard identification

GHS classification

Health hazards	Acute toxicity (Oral)	Unclassified
	Acute toxicity (Dermal)	Unclassified
	Acute toxicity (Inhalation: Vapors)	Category 4
	Skin corrosion/irritation	Category 2
	Serious eye damage/eye irritation	Category 2A
	Respiratory sensitization	Unclassified
	Germ cell mutagenicity	Category 2
	Carcinogenicity	Category 1B
	Reproductive toxicity	Category 1B
	Specific target organ toxicity/systemic toxicity - Single exposure	Category 3 (Narcotic effects, respiratory tract irritation)
	Specific target organ toxicity/systemic toxicity - Repeated exposure	Category 1 (Central nervous system)
	Aspiration hazard	Category 2

Environmental hazards	Hazardous to the aquatic environment, acute hazard	Category 2
	Hazardous to the aquatic environment, long-term hazard	Category 2

GHS label elements

Pictograms

Caution signal word Danger

Harms and hazards information

- Harmful if inhaled
- Causes skin irritation
- Causes serious eye irritation
- Suspected of causing genetic defects
- May cause cancer
- May damage fertility or the unborn child
- May cause respiratory irritation
- May cause drowsiness or dizziness
- Causes damage to central nervous system through prolonged or repeated exposure
- Toxic to aquatic life with long lasting effects

Precautionary statements

[Prevention]
- Obtain special instructions before use.
- Do not handle until all safety instructions have been read and understood.
- Do not eat, drink or smoke when using this product.
- Wear protective gloves/eye protection/face protection.
- Wash hands thoroughly after handling.
- Do not breathe gas/vapors.
- Avoid release to the environment.

[Response]
- IF INHALED: Remove person to fresh air and keep comfortable for breathing.
- IF ON SKIN: Wash with plenty of water/soap. Take off contaminated clothing and wash it before reuse.
- IF IN EYES: Rinse cautiously with water for 15 minutes or longer. Remove contact lenses, if present and easy to do.
- IF SWALLOWED: Do NOT induce vomiting.
- Collect spillage.
- Get medical advice/attention if you feel unwell, if skin irritation occurs, if eye irritation persists, if exposed or concerned, or if swallowed.

[Storage]
- Store in a closed container in a well-ventilated place.

[Disposal]
- Dispose of contents/container based on related laws and regulations through appropriate processing by your company or commissioned processing by a waste processing company.

Other harms and hazards not covered by the GHS classification categories

- Trichloroethylene is noncombustible at room temperatures. However, under special conditions such as high temperatures or in high oxygen concentrations, it will ignite and will occasionally explode.

- The vapors have a strong narcotic effect, and may cause disorders in the liver and kidneys. Contact with the liquid will cause irritation of the eyes, and successive use will also result in skin irritation.
- As a result of the acute toxicity, temporary problems and also permanent problems will be caused to the central nervous system.
- In the situation where there is a fire, substances including toxic hydrogen chloride will be generated by thermal decomposition.

Composition/information on ingredients

Distinction between single product or mixture	Single chemical substance
Chemical or generic name	Trichloroethene
Other names	Trichloroethylene
Chemical characteristics (Chemical formula, etc.)	$CHCl=CCl_2$
CAS No.	79-01-6
Constituent concentration	Trichloroethylene 99% or higher
Official Gazette Reference No.	(Chemical Substances Control Law) (2)-105 Class II Specified Chemical Substance (Industrial Safety and Health Act) (2)-105 The Chemical Substances Control Law is applied
TSCA registration	Registered
EINECS No.	201-167-4

First-aid measures

Inhalation

- Move victim to a location with fresh air, loosen tight clothing to make the victim comfortable, and keep them warm until the arrival of a doctor. In the case where the victim stops breathing, immediately carry out artificial respiration and seek the attention of a doctor.

Skin contact

- Wash the parts of the body that were contacted using water. When the substance has contacted clothing, shoes and socks, immediately remove the articles and move away from them.

Eye contact

- Immediately wash the eyes with large amounts of clean running water for 15 minutes or longer. Hold the eyelids open with your fingers while having the victim move their eyes in various directions during the washing. Do not allow the victim to rub their eyes even if they are painful. Seek the attention of an eye specialist at the earliest opportunity.

Ingestion

- Without inducing vomiting, seek the attention of a doctor. In the case where the victim vomits, at least make sure to keep the victim’s head facing to the side. In the situation where there is a danger of the victim losing consciousness, have the victim wait or carry them while they are in a stable position lying down.

Fire-fighting measures

Extinguishing media

- Dry powder fire extinguishers, water spray, foam or CO_2 gas fire extinguishers

Unsuitable extinguishing media

- No information

Extinguishing method

- Although the substance is not spontaneously combustible, in the worst case where there is a fire, remove combustion sources from the origin of the fire and extinguish the fire using the extinguishing media.
- Keep all persons unrelated to disaster prevention activities upwind and away from the area. When the temperature rises due to fire, etc., thermal decomposition will occur, generating hydrogen chloride and chlorine together with highly poisonous phosgene. Therefore, wear protective breathing apparatus when carrying out disaster prevention activities.

Accidental release measures

Precautions regarding the human body, protective equipment, and emergency measures

(Leakages of large amounts)

- When carrying out work, be certain to wear protective breathing equipment, and also wear other appropriate protective equipment as required.

Environmental precautions

(Leakages of small amounts)

- Carry out adsorption using activated charcoal or similar substance or absorption using dry sand so that the spilled trichloroethylene does not flow into the sewerage system or into drains, or does not permeate into groundwater. Then carry out incineration processing of the collected substances.

(Leakages of large amounts)

- Prevent outflow of the substance from the container or tank. Using a pump, transfer the substance to a hermetically sealable metal container. Take care that the substance does not flow into public water areas. The remaining substance should be adsorbed using activated charcoal or wiped up using waste cloth.

Secondary accident prevention measures

- The activated charcoal or similar substance that was used to adsorb or absorb the trichloroethylene should be appropriately disposed of (by incineration) as special controlled industrial waste. (Refer to “Disposal considerations”)

Handling and storage

Handling

- Carry out work in accordance with the regulations relating to the Industrial Safety and Health Act. Note that because trichloroethylene is specified as a First Class Organic Solvent in the Ordinance on the Prevention of Organic Solvent Poisoning, the following items must be observed.
  (1) Facilities: There must be facilities for sealing the vapor emission source, or local exhaust ventilation equipment facilities.
  (2) Administration: An Operations Chief of the Work for Handling Organic Solvents must be appointed, inspection tours must be made of the work place, the equipment must be inspected, precautions must be notified concerning the use of organic solvents, and the organic solvent classification must be displayed.
  (3) The work environment must be regularly measured and the records stored.
  (4) Medical examinations must be implemented and the records stored.
  (5) Protective equipment must be used.
  (6) Storage of solvent and empty containers must be administered.
- The material safety data sheet (SDS) issued by the trichloroethylene deliverer or supplier should be received.

- The employer should make information about the substance common knowledge among the workers by the method either of giving continuous notification of the SDS in an easily viewed location in the work place, or of providing the notification to workers.
- The floor of the location where the substance is to be stored and handled should be made of a material that is able to prevent permeation underground. In addition, the floor should be maintained so that there are no cracks in the floor surface.
- Because trichloroethylene vapor is approximately 4.5 times heavier than air, it will easily collect together in low-lying areas. Install aspiration type exhaust ventilation equipment in a location close to the floor surface.

(Precautions for safe handling)

- When working indoors, prepare suitable exhaust ventilation equipment, and maintain the control concentration below the administrative limit.
- Take care to avoid leaks, overflows, and scattering of the substance, and do not unnecessarily generate vapors.
- In the situation where there is a danger of vapor inhalation or contact with the skin, wear appropriate protective equipment and carry our work from as far as possible upwind.
- Although the substance is noncombustible at room temperatures, do not expose the vapor to extremely high temperatures such as naked flames or electric heaters. If decomposition occurs at high temperatures, toxic gases such as hydrogen chloride, chlorine and phosgene will be generated.
- The tap of the container should only be opened when required, and should be kept closed at other times.
- Do not handle the container roughly, such as by letting it fall over, applying shock, or dragging it.
- Waste liquids including trichloroethylene must certainly be recovered to a dedicated container.

Storage

(Safe storage conditions)

- Arrange the floor surface so that even if there is a leak the leaked substance will not flow into public water areas or permeate underground.
- Place the substance in a sealed container and store it in a cool, well-ventilated place (such as a cool, dark area), avoiding direct sunlight and rainwater.
- In the situation where the substance is stored outdoors in drum cans, take measures such as providing a roof or applying a cover.
- When storing a container that has been opened, carefully check that the container is tightly sealed.

(Safe containers and packing materials)

- Containers, 18-liter canisters (tin-plated steel sheet, chromate coated steel sheet), drum cans (zinc phosphate coated steel sheet), tank lorries (stainless steel sheet), or glass bottles (for reagent chemicals) should be used.
- The packing used in the container lids and taps should utilize materials that will not corrode. Normally, polyethylene (use of copolymers is not possible) or fluorine resin sheets should be used.

Exposure controls/personal protection

Equipment measures

- Facilities for hermetically sealing the vapor emission source, or local exhaust ventilating equipment must be provided to maintain the control concentration. (Ordinance on the Prevention of Organic Solvent Poisoning)
- Body showers, hand washing and eye washing facilities must be provided close to the location where the substance is being handled, and their locations should be clearly indicated.

Exposure limit values

- Control concentration (Industrial Safety and Health Act) 10 ppm
- Permissible concentrations
  - Japanese Society for Occupational Health (2010) permissible concentration 25 ppm (135 mg/m^3)
  - American Conference of Governmental Industrial Hygienists (ACGIH) (2011)
    - Time Weighted Average (8 hours) (TWA) 10 ppm (54 mg/m^3)
    - Short-term exposure limit (15 minutes) (STEL) 25 ppm (135 mg/m^3)
  - Occupational Safety and Health Administration (OSHA) (1998)
    - Permissible Exposure Limit (PEL)
      - Time Weighted Average (8 hours) (TWA) 100 ppm
      - Ceiling Value (C) 200 ppm
    - Permissible maximum peak exceeding the permissible ceiling value (per 8-hour shift)
      - 5-minute period in any 2-hour period 300 ppm

Measuring methods

- Gas chromatograph spectrometry - Direct collection method
- Gas chromatograph spectrometry - Solid collection method (Silica gel tube or activated charcoal tube)
- Absorption spectroscopy - liquid collection method (Alkali-pyridine method)
- Detection tube method (Gastec Corp., Kitagawa, or Draeger)

Biological permissible values

Japanese Society for Occupational Health (2011)

Measurement subject		Biological permissible values	Sample collecting time
Urine	Total trichloro-compounds	150 mg/l	Within 2 hours of completing work in the latter half of the week
Urine	Trichloroethanol	100 mg/l	Within 2 hours of completing work in the latter half of the week
Urine	Trichloroacetic acid	50 mg/l	Within 2 hours of completing work in the latter half of the week

Protective equipment

- Breathing protective equipment: The absorbent of the gas masks for organic gases, air supply masks, and air breathing apparatus should be replaced regularly or each time the equipment is used.
- Hand protective equipment: Protective gloves (Solvent resistant type)
- Eye protective equipment: Safety goggles, face shield, etc.
- Skin and body protective equipment: Occupational health protective clothing, long boots, apron, etc. (Solvent resistant type)
- Other: Because trichloroethylene penetrates into rubber, care will be required regarding inspections.

Physical and chemical properties

Form:	Colorless transparent liquid
Odor:	Odor similar to chloroform
Molecular weight:	131.39
Boiling point:	87.2 °C
Melting point:	-86.4 °C
Flash point:	None (In air at normal temperatures)

Ignition point:	425 °C (In air) [13] 396 °C (In oxygen) [13]
Explosive range:	9.3 - 44.8 vol% (80±3 °C) (In air) [13] 8.0 vol% (80±3 °C) - 79.0 vol% (90±3 °C) (In oxygen) [13] Because the liquid has no flash point in air, there will be no danger of of ignition or explosion under normal usage conditions. However, if a high-energy fire source such as a welding flame is applied to a hermetically sealed container such as a drum can containing trichloroethylene, there will be a possibility of explosion. If decomposition or explosion occurs, toxic gases such as hydrogen chloride will be generated. [13]
Vapor pressure:	7.7 kPa (20 °C); 57.8 mmHg (20 °C)
Volatility:	(Relative value taking speed of n-butyl acetate volatility at 25 °C as 1.00) = 6.39
Specific density:	1.465 (20/4 °C)
Vapor specific density:	4.53 (Air=1)
Solubility:	Sparingly soluble in water (Solubility in water of 0.11g/100g H_2O at 25 °C) [6] Blends mutually well with organic solvents. Dissolves oils, fats and greases, and generally dissolves or expands plastics and rubber.
Octanol-water partition coefficient:	logPow 2.29 [13]
Viscosity:	0.566mPa·s

Stability and reactivity

Reactivity

- Under the presence of strong caustic alkalis, a dehydrochlorination reaction will occur, generating dichloroacetylene (which is spontaneously combustible and toxic). [2]

Harmful and hazardous reaction possibility

- Under normal conditions, the substance is noncombustible, and there is no danger of ignition or explosion. However, in the situation of high oxygen concentration gas compositions, or in the case of high energy ignition sources, ignition or explosion may occur and toxic gases may be generated through decomposition. [2]

Mixed melting hazard substance

- If the substance contacts metals such as aluminum, decomposition or explosion may occur in some circumstances. [2]

Toxicological information

Acute toxicity

The most prominent symptom of acute toxicity in trichloroethylene is the narcotic effects. Although many fatal accidents have been reported, many of these are deaths from loss of consciousness due to the narcotic effect.

Oral Rat LD_{50} 5,560 mg/kg [9]

Inhalation Mouse LD_{50} 8,450 ppm (4 h) [9] Rat LC_{50} 4,800ppm (4 h) [7, 8]

Dermal Rabbit 29,000mg/kg [7]

Skin corrosion/irritation

In primary irritant testing using rabbits, it is thought that severe dermal primary irritation is caused. [8]

Serious eye damage/eye irritation

In cases of accidents involving humans, it was found that “When undiluted solution splashed into the eyes, eye pain and damage to the corneal epithelium was caused, but this was completely recovered several days

afterwards". In eye irritant testing using rabbits, it was found that "Slight to medium severity conjunctivitis was caused. The epithelial keratosis was recovered 7 days afterwards, and complete recovery was realized two weeks afterward." [8]

Rabbit 20 mg/24 h Moderate (Standard Draize test) [9]

Respiratory sensitization

There are reports stating that "There are no reports indicating respiratory sensitization in humans, and in cases of aspiration exposure of humans all the evidence indicates that trichloroethylene is not a respiratory sensitization substance." [8]

Skin sensitization

No specific information

Germ cell mutagenicity [8), (10), (11)

Heritable mutagenicity testing (dominant lethal testing) was negative.

There is no germ cell *in vivo* mutagenicity testing.

Somatic cell *in vivo* mutagenicity testing (micronucleus testing) was positive.

There is no germ cell *in vivo* genotoxicity testing.

Carcinogenicity

Japanese Society for Occupational Health (2008)

Group 2B (The substance has been determined to be possibly carcinogenic to humans (with relatively insufficient evidence)

International Agency for Research on Cancer (IARC) (1999)

Group 2A (The agent is probably carcinogenic to humans)

American Conference of Governmental Industrial Hygienists (ACGIH) (2010)

Category A2 (Substance for which the evidence of carcinocenicity in humans is limited, but there is sufficient evidence in animal testing relating to carcinogenicity in humans)

United States Environmental Protection Agency (EPA) (1999)

Not evaluated

United States National Toxicology Program (NTP) (2002)

R (Reasonably anticipated to be a human carcinogen)

European Union (EU) (1998)

Category 2 (Substances which should be regarded as if they are carcinogenic to humans.

Deutsche Forschungsgemeinschaft (DFG)

Category 1 (Substances which cause cancer in man and which can be assumed to make a significant contribution to cancer risk.)

Reproductive toxicity [10]

There are reports of dosages that did not appear to cause toxicity in parental animals, but appeared to cause behavioral changes in their offspring.

Specific target organ toxicity/systemic toxicity – Single exposure [10]

Regarding humans, there are reports of "Loss of consciousness, headaches, nausea, lacrimation, and eye pain".

Regarding experimental animals, reports include "Indication of stupor, eye and respiratory organ irritation, reduction in movement coordination, central nervous system inhibition, and respiratory disorders. The main toxicity symptom is the inhibition of the central nervous system. Significant changes were not apparent in the lungs, liver, and kidneys." From this, it is thought that the substance causes narcotic effects and respiratory tract irritation.

Specific target organ toxicity/systemic toxicity – Repeated exposure [10]

Regarding humans, there are reports of "narcotic effects, effects on the central nervous system and

dependency found from epidemiological surveys" and "many exposure reports of central nervous system inhibition relating to recurring toxicity in humans with common symptoms of fatigue, mental disorder, dizziness, headaches, memory loss, and lack of concentration", and it is thought that the target organ is the central nervous system.

Aspiration hazard [12]

There are reports of the "danger of causing chemical pneumonia due to aspiration while swallowing the liquid".

Ecological information

Ecological toxicity (Acute hazard to the aquatic environment)

Fish	Guppy	LC_{50} (7 d)	55 ppm [10]
	Fathead minnow	LC_{50} (96 h)	40.7 mg/l (In running water) [10]
Crustaceans	Daphnia magna	LC_{50} (48 h)	7.4 mg/l [10]

Biological accumulation

Low concentration (in carp) (Concentration magnitude: 17 times or less/6 weeks) [5]

Persistence/degradability

Persistence [Degradability 2.4% (BOD)] [5]

Behavior in the environment [27]

The lifetime in the atmosphere is 0.018 year (estimated value), and the halocarbon global warming potential (HGWP) (CFC-11=1) is <0.001 (estimated value), which is extremely small.

Environmental standards

- Environmental standards relating to water pollution
  Environmental standard relating to human health protection: 0.03 mg/liter or less (Annual average value)
  Environmental standard relating to groundwater pollution: 0.03 mg/liter or less (Annual average value)
- Environmental standard relating to soil pollution: 0.03mg/ test liquid liter or less
- Environmental standard relating to atmospheric pollution: 0.2 mg/m^3 (1 year average)

Disposal considerations

- In addition to the "Handling and storage" section, because the substance is considered as a hazardous substance under the Water Pollution Control Act, and as special controlled industrial waste under the Waste Management and Public Cleansing Act, the items stipulated in these related laws will apply.

Situation of small amounts

- Even cloth that has been used to wipe up trichloroethylene, or small amounts of the liquid, must not be buried or disposed of as it is. Be certain to temporarily store this in dedicated sealable containers and then process and dispose of it as special controlled industrial waste.

Situation of large amounts

- Concerning the processing of special controlled industrial waste, processing and disposal should be carried out using methods such as incineration that will not cause environmental pollution. In the situation where processing is commissioned to an outside company, a special controlled business waste product administration form (manifest) should be issued to commission a special controlled industrial waste treatment business that has received the approval of the prefectural governor, and appropriate processing should be carried out in conformance with the related laws and regulations.

Contaminated containers and packaging

- Empty containers must not be reused or disposed of as they are. When they are to be reused or disposed of, they should be washed until there is no more trichloroethylene, and the liquid from the washing should undergo neutralization treatment.

Situation when incinerated

- Because the substance will generate hydrogen chloride when incinerated, neutralization treatment should be carried out on the waste gas. The incineration method should use an adequately combustible fuel such as a solvent or fuel oil, and should utilize an incinerator equipped with an after-burner, scrubber, bag filter, and electronic dust collector. Incineration should be carried out at the highest temperature possible, and it will be important that the waste gas is rapidly cooled to prevent the generation of dioxins.

Transport information

- Refer to “Handling and storage”

UN Regulations

UN No.	1710
UN Classification	Class 6.1 (Toxic substances)
Container class	III

Domestic regulations

Marine pollutants (Ordinance for Enforcement of the Act on Prevention of Marine Pollution and Maritime Disaster): Toxic substance

Bulk cargo transportation (Order for Enforcement of the Act on Prevention of Marine Pollution and Maritime Disaster): Noxious liquid substance Type Y

Act on Port Regulations	Toxic substance
Ship Safety Act	Toxic substance
Civil Aeronautics Act	Toxic substance

Special safety measures and conditions for transportation or means of transportation

- Place substance in sturdy containers that do not easily become deformed or damaged,and hermetically seal them for transportation.
- During transportation, confirm that there are no leaks from the containers, carry out loading without allowing the containers to fall over, drop, or become damaged, and securely implement cargo shifting prevention measures.

Regulatory information

(1) Labor Standards Act

- Article 62 (Restrictions on Dangerous and Harmful Jobs) (Restrictions on Dangerous and Harmful Jobs for Minors under 18 years old)

○ Ordinance for Enforcement of the Labor Standards Act

- Article 34-3 (Cases where an Employer may have Trainees engage in Dangerous Work)
  Appended Table 1 (Scope of Dangerous and Injurious Work, and Standards on Measures to be taken by Employers)
- Article 35 (Scope of Illness in the Course of Employment)
  Appended Table 1-2 No.4-1 (Illness caused by Chemical Substances)

○ Designation of Simple Chemical Substances or Compounds specified by the Minister of Labour together with Illnesses specified by the Minister of Labour (Notification)

Trichloroethylene

Central nervous acute irritation symptoms, narcosis, ocular surface damage, respiratory tract disorders, optic nerve disorders, trigeminal nerve disorders, multiple peripheral nerve disorders, or liver damage

○ Regulations on Labor Standards for Minors

- Article 8 No. 33 Standards on Individual Measures to be taken by Employers relating to Work, Paragraph 5 High Level Harmful Substances (Notification)
  Medium level harmful substances: Trichloroethylene

(2) Industrial Safety and Health Act

- Article 14 (Operations Chief)
- Article 57 (Substances Subject to Indicate Their Names)
- Article 57-2 (Delivery of Documents (Chemical Substance Safety Data Sheet (SDS))
- Article 59 (Safety and Health Education)
- Article 65 (Working Environment Measurement)
- Article 66 (Medical Examinations)
- Article 101 (Dissemination of the Act and Ordinances) (Notification to Workers of Laws, Regulations, and SDS)
- Guidelines relating to Investigations of Hazards and Harms (March 10, 2006)
- Guidelines relating to Investigations of Hazards and Harms caused by Chemical Substances (March 30, 2006)

○ Order for Enforcement of the Industrial Safety and Health Act

- Article 6 (Work requiring Appointment of an Operations Chief)
  22 Work in Indoor Workshops or Tanks, Ship's Holds, or Mines
  Appended Table 6-2 (Organic Solvents)
  36 Trichloroethylene
  Trichloroethylene compounds (Compounds in which substance exceeds 5% (in weight))
- Article 18 (Dangerous and Toxic Substances Subject to Indicate Their Names)
  21 Trichloroethylene
- Article 18-2 (Dangerous and Toxic Substances Subject to Indicate Their Names)
  Appended Table 9 384 Trichloroethylene
- Article 21 (Workshop Subject to Carrying out Working Environment Measurement)
  22 Work in Indoor Workshops or Tanks, Ship's Holds, or Mines
  Appended Table 6-2 (Organic Solvents)
  36 Trichloroethylene
  Trichloroethylene compounds (Compounds in which substance exceeds 5% (of weight))
- Article 22 (Harmful work Subject to Carrying out Medical Examinations)
  22 Work in Indoor Workshops or Tanks, Ship's Holds, or Mines
  Appended Table 6-2 (Organic Solvents)
  36 Trichloroethylene
  Trichloroethylene compounds (Compounds in which substance exceeds 5% (in weight))

○ Ordinance on Industrial Safety and Health

- Article 16 (Appointment of an Operations Chief)
  Operations Chief of the Work for Handling Organic Solvents
- Article 24-2 (Guidelines for Promotion of Voluntary Activities)
  Guidelines relating to Industrial Safety and Health Management Systems
- Article 30 (Dangerous and Toxic Substances Subject to Indicate Their Names)
  Appended Table 2
  Preparations and Other Substances containing Trichloroethylene

However, substances in which the amount of trichloroethylene (in weight) is 5% or less are excluded.

- Article 31 (Labeling of Names, etc.)

○ Ordinance on the Prevention of Organic Solvent Poisoning

- Article 1 Paragraph 1-3 (First Class Organic Solvents, etc.)
- Article 19 (Appointment of Operations Chief of the Work for Handling Organic Solvents)
- Article 24 (Notification)
- Article 25 (Display of Classification of Organic Solvents, etc.)
- Article 29 (Medical Examinations)

○ Working Environment Measurement Standards

- Article 13 (Measurement of Organic Solvent Concentrations)
  Appended Table 2 Trichloroethylene

○ Working Environment Assessment Standards

- Article 2 (Assessment of Measurement Results)
  Appended Table (Control Concentrations) Trichloroethylene 10 ppm

(3) Working Environment Measurement Act

(4) Act on the Evaluation of Chemical Substances and Regulation of Their Manufacture, etc. (Chemical Substances Control Law)

- Article 2 (Definitions, etc,) (Class II Specified Chemical Substances)
- Article 26 (Notification of the Planned Quantity of Manufacture, etc.)
- Article 27 (Publication of Technical Guidelines, etc.)
- Article 28 (Labeling, etc.)

○ Order for Enforcement of the Act on the Evaluation of Chemical Substances and Regulation of Their Manufacture, etc.

- Article 1-2 (Class II Specified Chemical Substances)
  Trichloroethylene

○ Labeling of Containers, Packaging, and Invoices relating to Measures for Environmental Pollution Prevention (Notification)

○ Technical Guidelines relating to Measures for Prevention of Environmental Pollution by Trichloroethylene, or by Tetrachloroethylene in Businesses other than Cleaning Businesses (Notification)

(5) Act on Confirmation, etc. of Release Amounts of Specific Chemical Substances in the Environment and Promotion of Improvements to the Management Thereof
(Law for Promotion of Chemical Management or PRTR Law)
(Issued July 13, 1999 Enacted March 30, 2000)

- Article 2 (Definitions) Paragraph 2 (Class I Designated Chemical Substance)
- Article 2 Paragraph 5 (Business Operator Handling a Class I Designated Chemical Substance, etc.)
- Article 3 (Chemical Substance Management Guidelines)
- Article 5 (Confirmation and Notification of Release Amounts, etc. (PRTR))
- Article 14 (Provision of Information on the Properties and Handling of Designated Chemical Substances, etc.)

○ Order for Enforcement of the Act on Confirmation, etc. of Release Amounts of Specific Chemical Substances in the Environment and Promotion of Improvements to the Management Thereof

- Article 1 (Class I Designated Chemical Substance)
  Appended Table 281 Trichloroethylene
- Article 3 (Types of Business)
  Manufacturing (All business types)

Machine repair shops
Industrial waste disposal business (including special controlled industrial waste disposal business)
Higher education institutions (including adjunct facilities)
Natural science research institutes

- Article 4 (Requirements for Business Operators Handling Class I Designated Chemical Substances, etc.)

  For the business types in Article 3, and businesses applicable to all of the required conditions in (1) and (2)

  (1) Amount of Class I Designated Chemical Substances used in the course of business activities:

  1 ton or more during the fiscal year (5 tons or more in the initial 2-year period)

  (2) No. of employees who are regularly employed: 21 or more

- Article 5 (Requirements Specified by Cabinet Order Set Forth in Article 2, Paragraph (5), Item (i) of the Act)

  The Class I Designated Chemical Substance should account for 1 percent or more of the total mass of the product

- Guidelines relating to Measures for the Management of Class I Designated Chemical Substances and Class II Designated Chemical Substances that should be devised by Businesses handling Designated Chemical Substances (Chemical Substance Management Guidelines)

  (Application of information relating to the conditions and handling including improvement and management methods for facilities that manufacture, use, or otherwise handle the substances, rationalization of usage including recovery and reuse of substances in manufacturing processes, rationalization of management methods and use, together with the promotion of understanding by citizens of the discharge conditions)

(6) Basic Environment Act

○ Environmental standards relating to water pollution

- Environmental standard relating to human health protection:
  0.03 mg/liter or less (Annual average value)
- Environmental standard relating to groundwater pollution:
  0.03 mg/liter or less (Annual average value)

○ Environmental standard relating to soil pollution: 0.03 mg/ test liquid liter or less

○ Environmental standard relating to atmospheric pollution: 0.2 mg/m^3 (1 year average)

(7) Water Supply Act

○ Ordinances relating to water quality standards 0.01 mg/liter or less

(8) Water Pollution Control Act

- Article 2 (Definitions) 2 (Specified Facilities)
- Article 2 (Definitions) 4 (Oil Storage Facilities etc.)
- Article 3 (Effluent Standards)
- Article 5 (Notification of the Installation of Specified Facilities)
- Article 12 (Restrictions on Discharge of Effluents)
- Article 12-3 (Restrictions on Permeation of Specified Percolated Water)

  Prohibition of percolation to Groundwater of Specified Permeation Water including Harmful Substances (0.002 mg/liter or more)

- Article 12-4 (Obligation to observe Structural Standards in Specified Facilities using Harmful Substances)
- Article 14-2 (Measures to be Taken in Case of an Accident)

- Article 14-3 (Order to Take Measures, etc., Related to Purification of Ground Water Quality)
- Article 14-5 (Measurement of Pollution Condition of Discharged Water, etc.)

○ Order for Enforcement of the Water Pollution Control Act

- Article 1 (Specified Facilities)

  Appended Table No.1 (Specified Facilities)

  Cleaning facilities using trichloroethylene

  Distilling facilities using trichloroethylene
- Article 2 (Substances posing a Risk of Damaging Human Health)

  Trichloroethylene
- Article 4-4 (Harmful Substance Storage Specified Facilities)

○ Ordinance for Enforcement of the Water Pollution Control Act

- Article 8-2 (Structural Standards in Specified Facilities using Harmful Substances)
- Article 9-2-2 (Inspection Items and Frequency)
- Article 9-2-3 (Recording and Storage of Inspection Results)
- Article 9-3 (Order to Take Measures, etc., Related to Purification of Ground Water Quality)

  Purification standards 0.03 mg/liter

○ Ordinance of Prime Minister's Office defining Discharge Standards

- Article 1 (Discharge Standards)

  Appended Table 1 (Permissible Limits) 0.3 mg/liter

(9) Act on the Improvement of Pollution Prevention Systems in Specified Factories

- Article 2 (Definitions) (Specified Factories)
- Article 3 (Appointment of Pollution Prevention Control Officer)
- Article 4 (Appointment of Pollution Prevention Manager)
- Article 5 (Appointment of Pollution Prevention Chief Manager)
- Article 6 (Appointment of Representative)

(10) Sewerage Act

- Article 12-2 (Control of Elimination of Sewerage from Designated Businesses)
- Article 12-3 (Notification of the Settings etc. of Specific Sections)

○ Order for Enforcement of the Sewerage Act

- Article 9-4 (Water Quality Standards for Elimination of Sewerage from Designated Businesses)

  0.3 mg/ liter or less

(11) Air Pollution Control Act

- Article 2 (Definitions) Paragraph 4 (Volatile Organic Compounds)
- Chapter 2-4 (Promotion of Measures to Reduce Hazardous Air Pollutants)

○ Order for Enforcement of the Air Pollution Control Act

- Designated Substance Trichloroethylene
- Designated Substance Emission Facility

  Drying facilities for evaporation (Fan blower with ventilation capacity of 1,000m^3/hr or greater)

  Mixing facilities (Mixing tank capacity 5 kiloliters or greater) (Excluding sealed systems)

  Distilling facilities offering use for refining or recovery (Excluding sealed systems)

  Cleaning facilities (Facilities with a surface area of 3m^2 or greater contacting the air)

○ Environment Agency Notification

- Designated Substance Emission Standards

  Drying facilities for evaporation (Fan blower with ventilation capacity of 1,000m^3/hr or greater)

  Facilities for evaporating trichloroethylene used as a solvent

  New structure 300 mg/m^3

Existing structure 500 mg/m^3

Mixing facilities (Mixing tank capacity 5 kiloliters or greater) (Excluding sealed systems)

Facilities using trichloroethylene as a solvent

New structure 300 mg/m^3

Existing structure 500 mg/m^3

Distilling facilities offering use for refining or recovery (Excluding sealed systems)

Facilities offering use for trichloroethylene refining and facilities offering use for recovery of trichloroethylene that was used as a raw material

New structure 150 mg/m^3

Existing structure 300 mg/m^3

Cleaning facilities (Facilities with a surface area of $3m^2$ or greater contacting the air)

New structure 300 mg/m^3

Existing structure 500 mg/m^3

Note: New structure: Designated Substance Emission Facility installed after April 1, 1997

Existing structure: Designated Substance Emission Facility already installed at April 1, 1997

○ Promotion of Voluntary Management of Hazardous Air Pollutants by Business Entities

- Guidelines for Promotion of Voluntary Management of Hazardous Air Pollutants by Business Entities

Subject Substance: Trichloroethylene

(12) Soil Contamination Countermeasures Act

- Article 2 Definitions (Designated Hazardous Substance)

○ Order for Enforcement of the Soil Contamination Countermeasures Act

- Article 1 Designated Hazardous Substance: Trichloroethylene

○ Ordinance for Enforcement of the Soil Contamination Countermeasures Act

- Article 18 Environmental Standards for Specifying Designated Areas

Appended Table 2 Designated Hazardous Substance Types: Trichloroethylene

Necessary Condition: 0.03 mg or less per liter of test liquid

(13) Waste Management and Public Cleansing Act (Waste Disposal Law)

- Article 2 Paragraph 5 (Special Controlled Industrial Waste)
- Article 12-2 (Management of Special Controlled Industrial Waste by Business Entities)
- Article 12-3 (Control Manifest of Industrial Waste)
- Article 12-5 (Use of Electronic Information Processing System (Electronic Manifest))
- Article 14-4 (Special Controlled Industrial Waste Management Service)

○ Ordinance of Prime Minister's Office defining Judging Standards of IndustrialWaste including Metals

Water-soluble sludge, etc.	0.3 mg/liter of test liquid or less
Waste acid and alkali	0.3 mg/liter of test liquid or less
Other than waste acid and alkali	0.3 mg/liter of test liquid or less

(14) Act on Prevention of Marine Pollution and Maritime Disaster

Described in “Transport information”

(15) Act on Control of Export, Import and Others of Specified Hazardous Wastes and Other Wastes (Domestic law on the Basel Convention on the Control of Transboundary Movements of Hazardous Wastes and Their Disposal)

- Article 2 Paragraph 1 Item (i) a) (Specified Hazardous Wastes, etc.)

○ Substances defined in Article 2 Paragraph 1 Item (i) a) of the Law

38 Products including 0.1% or more of halogenated organic solvents (Trichloroethylene)

(16) Act on Control of Household Products Containing Harmful Substances

○ Order for Enforcement of the Act on Control of Household Products Containing Harmful Substances

- Article 1-5

Household aerosol products and household detergents

Trichloroethylene 0.1% or less

(17) Act on Port Regulations

○ Ordinance for Enforcement of the Act on Port Regulations

- Article 12 (Hazardous Substance Types) (Toxic Substances)

(18) Ship Safety Act

○ Regulations for the Carriage and Storage of Dangerous Goods by Ships

- Article 3 (Classifications, etc.)

Notification Defining Standards for the Carriage of Dangerous Goods in Ships

Appended Table 1

Trichloroethylene: Toxic Substances

(19) Civil Aeronautics Act

○ Ordinance for Enforcement of the Civil Aeronautics Act

- Article 194 (Transportation Prohibited Substances)

Notification Defining Standards for the Carriage of Explosives, etc. in Aircraft

Article 2 (Classification and Divisions)

Appended Table 1

Trichloroethylene: Toxic Substances Poisons

Other information

References

(1) Journal of Safety Technology, Vol.6, No.1 (1967)

(2) Editing by Gunter Hommel, Translation by Rokuro Nii, Handbook of Dangerous Substances (1992)

(3) 1979 Version of Chemical Assessment Manual Report, Chemicals in the Environment, Environment Agency, Department of Environmental Health, Office of Health Studies

(4) Report on Criteria relating to Trichloroethylene (Netherlands), Translation by the Japan Society for Hygiene of Chlorinated Solvents (1986)

(5) Supervision by the Ministry of International Trade and Industry Basic Industries Bureau Chemical Substance Safety Section, Editing by the Chemicals Inspection & Testing Institute, Handbook of Safety Inspection Data of Existing Chemical Substances in the Chemical Substances Control Law, Japan Chemical Industry Ecology-Toxicology & Information Center (JETOC) (1992)

(6) Supervision by Ministry of International Trade and Industry, Basic Industries Bureau, Chemical Product Safety Section and the Environmental Protection and Industrial Location Bureau, Guidance Section, Editing by the Japan Society for Hygiene of Chlorinated Solvents, Manual of Proper Handling and Use of Trichloroethylene and Tetrachloroethylene (Revised Edition), Ministry of Economy, Trade and Industry Research Institute (1993)

(7) NICNAS No.8 (2000)

(8) EU-RAR No.31 (2004)

(9) Registry of Toxic Effects of Chemical Substances (RTECS), NIOSH(1994)

(10) CERI-NITE Hazard Assessment No.37 (2004)

(11) ASTDR (1997)

(12) ICSC (J)(2002)

(13) Matsui, Flammability Evaluation of Halogenated Hydrocarbons such as Alternative CFCs, Specific

Research Reports of the Research Institute of Industrial Safety (RIIS-SRR) No.12:23-31 (1993)

(14) Editing by The Chemical Society of Japan, Chemical Disaster Prevention Guideline Compilation I. Substances Edition, p.I-421-I-424, Maruzen (1996)

(15) Editing and Issue by Japan Society for Hygiene of Chlorinated Solvents, Handbook of Proper Handling and Use of Chlorocarbons (1996)

(16) Editing by Ministry of Labour, Industrial Safety and Health Department, Industrial Health Division, New Version, Explanation of the Ordinance on the Prevention of Organic Solvent Poisoning, Japan Industrial Safety and Health Association (1998)

(17) Editing by Ministry of Labour, Industrial Safety and Health Department, Industrial Health Division, New Version, Textbook on Operations Chief of Organic Solvents Work, Japan Industrial Safety and Health Association (1997)

(18) Editing by Ministry of Labor, Industrial Safety and Health Department, Chemical Substances Investigation Division, Practice of Operations Chief of Organic Solvents Work – Textbook of Performance Improvement Education, Japan Industrial Safety and Health Association (1992)

(19) Editing by Ministry of Labor, Industrial Safety and Health Section, Revised Edition, Knowledge and Practice of Organic Solvent Poisoning Prevention – Textbook for Worker Education, Japan Industrial Safety & Health Association (1990)

(20) Editing by Ministry of Labor, Industrial Safety and Health Section, Local Exhaust Ventilation and Air Cleaning Equipment Standard Design and Maintenance Administration, First Volume: Local Exhaust Ventilation Equipment Edition and Second Volume: Air Cleaning Equipment Edition, Japan Industrial Safety & Health Association (1985)

(21) Editing by Ministry of Labor, Industrial Safety and Health Department, Environmental Improvement Bureau, Textbook of Local Exhaust Ventilation Equipment Airflow Adjustment Certifiers, Japan Industrial Safety & Health Association (1997)

(22) Editing by Ministry of Labor, Industrial Safety and Health Department, Environmental Improvement Bureau, Working Environment Measurement Guidebook 5 – Organic Solvents, Japan Association for Working Environment Improvement (1998)

(23) Organization for Small & Medium Enterprises and Regional Innovation, Japan, Small and Medium-Sized Enterprise Chemical Substance Safety Measure Information Provision and Guidance Project, Chemical Substance Safety Measures Training Textbook (FY1997), Organization for Small & Medium Enterprises and Regional Innovation, Japan (1998)

(24) Organization for Small & Medium Enterprises and Regional Innovation, Japan, Small and Medium-Sized Enterprise Chemical Substance Safety Measure Information Provision and Guidance Project, Chemical Substance Safety Measures Distribution Manual (FY1997), Organization for Small & Medium Enterprises and Regional Innovation, Japan (1998)

(25) Organization for Small & Medium Enterprises and Regional Innovation, Japan, Small and Medium-Sized Enterprise Chemical Substance Safety Measure Information Provision and Guidance Project, Chlorinated Organic Solvents used in Metal Cleaning, Voluntary Administration Achievement Manual – Based on part-revision of the Air Pollution Control Act (FY1997), Organization for Small & Medium Enterprises and Regional Innovation, Japan (1998)

(26) Organization for Small & Medium Enterprises and Regional Innovation, Japan, Small and Medium-Sized Enterprise Chemical Substance Safety Measure Information Provision and Guidance Project, Simple Analysis Manual of the Detection Tube Method – Centered on emission gas concentration analyses, Organization for Small & Medium Enterprises and Regional Innovation, Japan (1999)

(27) H. Sidebottom, J. Franklin, The Atmospheric Fate and Impact of Hydrochlorofluorocarbons and Chlorinated Solvents, Pure & Appl. Chem., 68 (9): 1757-1769 (1996)

(28) Supervision by Air Pollution Control Act Association, Hazardous Air Pollutants Emission Measures Manual, Gyosei Corporation (1999)
(29) Law for Promotion of Chemical Management PRTR/MSDS Subject Substance All Data, The Chemical Daily (2000)

Handling of the data in this SDS

There may be some information omissions since not all data and documents were reviewed. Further, with new information and correction of earlier views, the data of this SDS will be revised. If this SDS is used for making important decisions, it is advisable that references should be adequately reviewed or that tests are conducted to ascertain the information. The numerical values of the constituent amounts and physical and chemical properties are not guaranteed values. Further, because the precautions are provided for normal handling, care will be required when carrying out special handling.

For more information regarding the contents described

Department in charge: Environment & Safety Dept., Technical Div.
Tel. No.: 81-3-3257-0527 Fax No.: 81-3-3257-2231