SAFETY DATA SHEET

Sodium Cyanide 30% Solution - UN3414

ABN: 81 008 668 371

Section 1 – Identification of the Material and Supplier

Product Name
Sodium Cyanide 30% Solution

Other names
Cyanide solutions NOS, Sodium cyanide solution, liquid cyanide. Company product 1360.

Recommended use
Gold processing reagent, metallurgy, silver refining.

Company name
CSBP Limited

Address	State	Postcode
Kwinana Beach Road, KWINANA	Western Australia	6167

Telephone number	Emergency telephone number
(08) 9411 8777 (Australia), +61 8 9411 8777 (Overseas)	1800 093 333 (Australia), +61 8 9411 8444

Section 2 – Hazard Identification

Hazard Classification, including a statement of overall hazardous nature

HAZARDOUS SUBSTANCE

Sodium cyanide solution is classified as hazardous according to Australian WHS Regulations.

DANGEROUS GOODS

Sodium cyanide solution is classified for physicochemical hazards and specified as dangerous in the Australian Code for the Transport of Dangerous Goods by Road and Rail (ADG Code), 7th Edition.

GHS Classification(s)

Acute Toxicity: Oral: Category 2
Acute Toxicity: Dermal: Category 1
Acute Toxicity: Inhalation: Category 2
Skin Corrosion/Irritation: Category 2
Serious Eye Damage/Eye Irritation: Category 1
Specific Target Organ Toxicity (Repeated Exposure): Category 1
Aquatic Hazard (Chronic): Category 1
Aquatic Hazard (Acute): Category 1

Label elements

Signal word **DANGER**

Pictogram(s)

Hazard statement(s)

H300	Fatal if swallowed.
H310	Fatal in contact with skin.
H315	Causes skin irritation.
H318	Causes serious eye damage.
H330	Fatal if inhaled.

H372	Causes damage through organs through prolonged or repeated exposure.
H400	Very toxic to aquatic life.
H410	Very toxic to aquatic life with long lasting effects.
AUH032	Contact with acids liberates very toxic gas.

Prevention statement(s)

P260	Do not breathe dust/fume/gas/mist/vapours/spray.
P262	Do not get in eyes, on skin or on clothing.
P264	Wash thoroughly after handling.
P270	Do not eat, drink or smoke when using this product
P271	Use only outdoors or in a well-ventilated area.
P273	Avoid release to the environment.
P280	Wear protective gloves/protective clothing/eye protection/face protection.
P284	Wear respiratory protection.

Response statement(s)

P301 + P310	IF SWALLOWED: Immediately call a POSION CENTER or doctor/physician.
P302 + P350	IF ON SKIN: Gently wash with plenty of soap and water.
P304 + P340	IF INHALED: Remove victim to fresh air and keep at a rest position comfortable for breathing.
P305 + P351 + P338	IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing.
P310	Immediately call a POISON CENTER or a doctor/physician.
P314	Get medical advice/attention if you feel unwell.
P320	Specific treatment is urgent – see first aid instructions.
P330	Rinse mouth.
P332 + P313	If skin irritation occurs: Get medical advice/attention.
P362	Take off contaminated clothing and wash before re-use.
P391	Collect spillage.

Storage statement(s)

P403 + P233	Store in a well-ventilated place. Keep container tightly closed
P405	Store locked up.

Disposal statement(s)

P501	Dispose of contents/container in accordance with relevant regulations.

Other hazards

No information provided.

Section 3 – Composition/Information on Ingredients

Chemical identity of ingredients	Proportion of ingredients	CAS Number for ingredients
Sodium cyanide	27 to 31·5 % ($^{wt}/_{wt}$)	143-33-9
Sodium carbonate	Less than 4 % ($^{wt}/_{wt}$)	497-19-8
Sodium formate	Less than 4 % ($^{wt}/_{wt}$)	141-53-7
Sodium hydroxide	0·4 % to less than 2%($^{wt}/_{wt}$)	1310-73-2
Ammonia	Less than 0·3 % ($^{wt}/_{wt}$)	7664-41-7
Water	Remainder	7732-18-5

Section 4 – First Aid Measures

First Aid

TO BE EFFECTIVE, FIRST AID MUST BE PROMPT.

SODIUM CYANIDE SOLUTION IS POISONOUS BY INGESTION AND INHALATION OF ITS VAPOUR. CONTACT WITH SKIN AND EYES AND MAY CAUSE IRRITATION OF THE SKIN AND EYES AND POISONING SYMPTOMS SIMILAR TO THOSE FOR INGESTION.

OF PRIME IMPORTANCE IS THE PROTECTION OF THE RESCUER. NO ATTEMPT AT RESCUE SHOULD BE PERFORMED UNTIL AN APPROPRIATE HAZARD ASSESMENT OF THE EXPOSURE SITE IS MADE AND APPROPRIATE PERSONAL PROTECTION EQUIPMENT AND PERSONNEL ARE IN PLACE.

FIRST AID ATTENTION MUST BE GIVEN AS URGENTLY AS POSSIBLE AS OUTLINED BELOW. ALL SUSPECTED SODIUM CYANIDE INGESTION, INHALATION AND CONTACT SHOULD RECEIVE MEDICAL ATTENTION. TRAINING ON HANDLING SODIUM CYANIDE INCIDENTS USING THIS SDS SHOULD BE PROVIDED BEFORE ANY SODIUM CYANIDE SOLUTION HANDLING OR USE COMMENCES.

First Aid Facilities

First aid procedures, equipment, medication and training for the treatment of exposure to sodium cyanide should be in place BEFORE the use commences. First aid personnel should be aware of the nearest hospitals which are familiar with the treatment of sodium cyanide exposure.

Equipment and medication in place should be:

Safety shower and eyewash stations immediately accessible in the workplace;

Eye-wash bottle;

Personal protective equipment for use by first aid personnel;

Fresh, clean, cool drinking water;

Resuscitation bag and mask (or Oxy-Viva);

Cyanide Emergency Kit: containing Amyl Nitrite Pearls; Hydroxycobalamine and Sodium Thiosulfate;

Oxygen;

"Space" or thermal blankets for treating patients for shock.

FIRST AID PROCEDURES FOR DEALING WITH THIS PRODUCT AND EXPOSURE TO IT

1. Personal Protection By First Aid Personnel

First aid personnel providing first aid treatment to a patient exposed to sodium cyanide solid should observe the following precautions for their own personal protection:

- Avoid contact with contaminated skin, clothing and equipment by wearing protective gloves;
- Wear chemical goggles as a minimum level of eye protection to prevent sodium cyanide solution entering eyes;
- Avoid inhalation of sodium cyanide vapour during rescue in contaminate areas by wearing suitable respiratory protection;
- Respiratory protection suggested is: an air supplied breathing apparatus, or positive pressure self-contained breathing apparatus.

2. Swallowed

Immediately:

- Remove the patient from the source of contamination – to fresh air, if hydrogen cyanide gas (HCN) is present;
- If the patient is not breathing, do not use mouth to mouth, or mouth to nose ventilation, because of the danger to the rescuer, instead use a resuscitation bag and mask – (Oxy-Viva);
- If pulse is absent, start external cardiac massage and follow standard Advanced Cardiovascular Life Support (ACLS) guidelines;
- Give 100% oxygen by mask (Oxy-Viva) if available;
- Remove all contaminated clothing and footwear into a sealable collection bag – launder contaminated clothing thoroughly and wash the affected areas with soap and copious amounts of

water;

2. Swallowed (cont..)

- Arrange for the urgent transfer of the patient, accompanied by an attendant with the Cyanide Emergency Kit, to medical professionals;
- Those persons designated as competent may open the Cyanide Emergency Kit and commence use of any amyl nitrite pearls to treat the effects of cyanide exposure.

  Amyl Nitrite should not be used unless the patient is clearly deteriorating, despite oxygen administration, and there is a reasonable confidence that cyanide intoxication is the cause.

3. Eyes

Persons with potential eye exposure should not wear contact lenses.

Immediately irrigate eye with copious amounts of water, while holding eyelids open, for at least 15 minutes.

Seek medical assistance immediately.

4. Skin

Wash affected area with copious amounts of water for at least 15 minutes.

Remove contaminated clothing and launder before re-use.

Seek medical assistance following skin contact.

5. Inhalation

Proceed as for **2. Swallowed** above.

ADVICE TO DOCTOR.

Treatment should include the following measures:

- Immediate attention should be directed towards administration of 100 % oxygen, assisted ventilation if required, insertion of intravenous lines and institution of cardiac monitoring, if available;
- Attention should be given to monitoring the level of consciousness;
- Administer antidote if signs of serious cyanide poisoning are present:
  - Insert indwelling cannula into vein:
  - Take 5 mL of blood in a plain clotted tube (red top in Western Australia) for later confirmation of diagnosis by measurement of the cyanide level. (Take blood in a heparinised tube and place on ice for immediate transfer to laboratory if direct testing for cyanide levels is available). At the same time take blood for lactic acid level (urgent). An elevated lactic acid level is a useful test to assist in confirmation of the diagnosis.

    Note: Cyanide poisoning is a clinical diagnosis and treatment is instigated on clinical grounds.
- Treatment path
  - Administer intravenously 5 to 15 grams of hydroxycobalamine over 30 minutes, or faster if necessary. In the Cyanide Emergency Kit these are made up of two 2·5 gram doses that are set to be re-constituted with the saline in the plastic transfer device. An IV giving set is to be inserted into the re-constituted IV hydroxycobalamine bottle. If this has been left in the cardboard packet, it can be hung like an IV bottle through the hole in the top of the box;
  - Also administer sodium thiosulfate 12·5 grams over 10 to 20 minutes with the hydroxycobalamine;

    Note: Hydroxycobalamine is the recommended treatment in patients in whom the diagnosis is not clear and where there is a clinical suspicion of cyanide poisoning.
  - If cyanide has been swallowed, whilst gastric lavage, charcoal and cathartics may be used after an antidote therapy, if less than two hours have passed since ingestion, there is little evidence to support a benefit and one should take the advice of an emergency care physicians prior to commencing;
  - Specialist medical advice for ongoing management after the administration of antidotes is required with prompt referral of the patient to a tertiary medical facility.

    Note: The best way to treat metabolic and cardiorespiratory complications of cyanide poisoning is the use of an appropriate antidote.

Supportive care should include the following measures:

- All patients with suspected, or proven, cyanide poisoning should be taken to hospital for evaluation and observation:
- Follow the patient's progress for at least 24 hours;
- Watch for the development for pulmonary oedema and aspiration pneumonia in comatose patients;
- Consider more antidote if there is a persistent metabolic acidosis. Bicarbonate can be used cautiously. Correct metabolic acidosis with bicarbonate when blood pH falls below 7·20, and be sure to correct electrolyte imbalance (for example, hyperkalemia, hypercalcemia);
- Oxygen requirement would be expected to decrease after successful administration of the antidote.

Long Term Complications

No data available.

Further information about the treatment for exposure to this product can be obtained from the Poisons Information Centre on (08) 13 1126 (Australia only)

Section 5 – Fire Fighting Measures

Product flammability

Sodium cyanide solution is not combustible and is not considered a fire risk, but may generate toxic, flammable, corrosive and explosive hydrogen cyanide gas if in contact with water, CO_2 fire extinguishers, and some foam fire extinguishers if these contain acidic agents.

Suitable extinguishing media

DO NOT USE CARBON DIOXIDE. Extinguish fires with water spray or fog. Do not use straight stream of water. Most foams will react with sodium cyanide solution and release toxic and corrosive fumes. For small fires use dry chemical extinguishers or dry sand.

Hazard from combustion products

Although sodium cyanide itself is not combustible, intense heat may cause sodium cyanide to decompose, giving off toxic, flammable, corrosive and explosive hydrogen cyanide gas.

Special protective precautions and equipment for fire fighters

Wear full body protective clothing (PVC jackets and pants, PVC gloves and chemical resistant boots) with self-contained breathing apparatus with a full-face piece operated in pressure-demand or positive pressure mode. Prevent spillage from entering drains or waterways. Consider evacuation. Use water to control fire. Spilled sodium cyanide solution will cause surfaces to be slippery and slimy. If required, use soda ash, or other suitable alkaline material, to control the pH of the water/cyanide mixture created. If safe and practicable to do so remove sodium cyanide containers from path of fire.

Equipment should be thoroughly decontaminated after use.

After intervention, take shower, remove clothing carefully, clean and check equipment.

Hazchem Code

2X

Section 6 – Accidental Release Measures

Emergency procedures

The hazardous nature of sodium cyanide solution requires emergency and spill procedures to be effective to avoid both human and environmental exposure. Hazardous conditions may result if material is managed improperly. Make plans in advance to handle possible emergencies, including obtaining stocks of absorbent materials.

Always wear recommended personal protective equipment and respiratory protection. Good ventilation is necessary.

Methods and Materials for containment and clean up

For **ALL** spills, evacuate unprotected personnel upwind and out of danger. Wear appropriate personal protective equipment and breathing apparatus. If safe to do so, prevent further release of sodium cyanide solution. Shut off all possible sources of ignition. Stay upwind of any dust or mist released. Increase ventilation and allow any dust or mist released to vent to a safe area. Restrict access to spill site. If possible contain the surface area of a sodium cyanide solution spill by bunding with sand, earth or vermiculite. Avoid, or minimise, the use of water on spillage. Recover as much material as possible into dedicated drums and return to manufacturer. Using a shovel/front end loader as required, recover as much neutralised material as possible into dedicated drums for proper disposal accordance with the requirements of the Department of Environment Protection. For a large spill notify Fire and Rescue Services then CSBP Emergency Response.

Initial Clean Up With Ferrous Sulfate

Generously cover any remaining residue with lime or soda ash (to maintain pH at 9 or higher), add ferrous sulfate then add water and mix well. Allow about 30 minutes for complete penetration and neutralisation to take effect. Collect residue and store in dedicated container for disposal. Prevent run-off into drains and waterways. After clean up, test area for free cyanide level present; if free cyanide is more than 10 parts per million (ppm), repeat clean up using ferrous sulfate; if free cyanide is less than 10 ppm proceed with final clean up using hypochlorite solution.

Final Clean Up With Calcium/Sodium Hypochlorite

Make up a dilute aqueous chlorine solution using either calcium hypochlorite or sodium hypochlorite. Spray this chlorine solution evenly to the area to be decontaminated. After thorough contact of the chlorine solution with the contaminated area is made, test area for free cyanide present. If free cyanide is more than 1 ppm, repeat clean up using chlorine solution. Prevent run-off into drains and waterways.

For the management of cyanide emergencies during transport by road or rail, SAA/SNZ HB76: Dangerous Goods-Initial Response Guide, Guide 40 should be consulted. This Guide should be carried at all times when sodium cyanide is being transported.

Clean up personnel will need personal full protection equipment and respiratory protection. Portable safety shower and eyewash facilities may also be needed for clean up personnel. Bags of ferrous sulfate neutralising agent, calcium/sodium hypochlorite drums, bags of soda ash, or other suitable alkaline material, chemical absorbent and substantial amounts of water will be required for large spill. A front-end loader may be required to scoop up neutralised cyanide/lime/soda ash residue, as are dedicated empty drums to store the neutralised residue.

Section 7 – Handling and Storage

Precautions for safe handling

Regulated dangerous goods as Class 6.1 Toxic. Proper protective clothing must be worn that covers the body including the face. A safety shower and eyewash should be available. Do not breathe vapour or mist. Avoid contact with skin, eyes and clothing.

Do not smoke anywhere near the storage and handling of sodium cyanide solution or associated handling equipment.

Do not touch damaged containers or spilled material unless wearing appropriate personal protective equipment.

Change and wash clothing, and personal protective equipment if contaminated, or before storing and/or re-using. Wash hands and face thoroughly after handling and before work breaks, eating, drinking, smoking and using toilet facilities.

Conditions for safe storage, including any incompatibilities

Ensure sodium cyanide solution in bulk is stored and handled in accordance with Australian Standard AS 4452 *The storage and handling of toxic substances* and Dangerous Goods Safety Act 2004 (*Dangerous Goods Safety (Storage and Handling of Non-explosives) Regulations 2007*). Ensure adequate ventilation to keep airborne concentration below exposure standard. Where necessary, use local exhaust ventilation in conjunction with P2 canister respirator, or as appropriate, self contained breathing apparatus.

Keep workplaces and stores well ventilated. Above a correctly stored quantity of sodium cyanide solution there is a presence of hydrogen cyanide (HCN) gas. HCN is very slightly denser than air and disperses rapidly in air. Toxic concentrations of HCN can be reached when sodium cyanide solution is in prolonged contact with air in a closed area. HCN is flammable and, when its concentration in air is in the range of 5·4 to 46·6 % ($^{vol}/_{vol}$), it forms explosive mixtures. The concentration of HCN above sodium cyanide solution increases with decreasing pH of the sodium cyanide solution and with increasing ambient temperature of the solution. Sodium cyanide 30% solution manufactured by CSBP is stabilised against the effects of acidification by the presence of 0·4 % ($^{wt}/_{wt}$) free sodium hydroxide in the solution. Measurements indicate that in an unventilated space above sodium cyanide 30 % solution at 30 °C, the approximate HCN concentration is between 100 to 150 parts per million (ppm). At 40 °C, the HCN concentration is approximately between 150 to 200 ppm.

Store away from acids –sodium cyanide will release toxic and flammable hydrogen cyanide gas in contact with acids. Store away from chlorinating agents. Contact with these may form toxic cyanogen chloride gas. Incompatible with oxidizing agents, copper, zinc, magnesium, tin, or their alloys (i.e., bronze, brass, galvanised metals, etc.) and aluminium.

Section 8 – Exposure Controls/Personal Protection

National exposure standards

ES-TWA	ES-STEL	ES-Peak
5 mg/m^3 as Cyanide (CN^-) dust	No data assigned by NOHSC	No data assigned by NOHSC
10 ppm as Hydrogen Cyanide (HCN)	Peak Limitation	Peak Limitation

Biological limit values

No data available.

Engineering controls

Handle sodium cyanide solution within closed systems whenever possible. Provide adequate ventilation at all times.

Personal protective equipment

Whenever the risk of exposure exists, such as opening sodium cyanide solution storage tank valves, non-routine operations and emergency circumstances, the following personal protection measure are recommended:

Respiratory protection

Canister respirator P2 type if air sampling indicates hydrogen cyanide level is between 11 and 50 mg/m^3 (Australian Standard *AS 1716 Respiratory protective devices*). Air supplied, or positive pressure, self contained breathing apparatus recommended where air sampling indicates hydrogen cyanide gas concentration exceeds 50 mg/m^3.

Hand protection

PVC or butyl rubber gauntlet-type gloves.

Eye protection

Chemical splash goggles (gas tight type preferred) and full face shield.

Skin protection

PVC overalls or jacket and pants and butyl rubber Wellington boots.

Section 9 – Physical and Chemical Properties

Appearance (colour, physical form, shape)
Clear, colourless to red-brown liquid.

Odour
Appreciable ammonia odour

pH
Neat solution pH 13.

Vapour pressure
2·3 kPa at 20 °C

Vapour density
0·93 (Air =1)

Boiling point/range
109 °C at 101·3 kPa.

Freezing/melting point
Crystallises between 2 and 5 °C at 101·3 kPa.

Solubility
Solubility in all proportions in water; sparingly soluble in ethanol.

Specific gravity or density
Specific Gravity: 1·16 to 1·19 at 25 °C.

Flash point and method of detecting flash point
Not applicable

Upper and lower flammable (explosive) limits in air
Not applicable

Ignition temperature
Not applicable

Viscosity

Temperature (°C)	Viscosity (mPa.s)
21·5	10·3
30	7·6

Temperature (°C)	Viscosity (mPa.s)
50	2·0
80	0·9

Section 10 – Stability and Reactivity

Chemical stability
Stable at ambient conditions of use and storage.

Conditions to avoid
Contact with water, acids, acid salts and carbon dioxide lead to the liberation of hydrogen cyanide gas.

Incompatible materials
Incompatible with oxidizing agents, copper, zinc, magnesium, tin, or their alloys (i.e., bronze, brass, galvanised metals, etc.) and aluminium.

Hazardous decomposition products
Toxic and flammable hydrogen cyanide gas (HCN). Hydrogen gas forms explosive mixtures in air when air contains HCN in the range of 5·4 to 46·6 % ($^{vol}/_{vol}$).

Hazardous reactions
Store away from acids, acid salts, water & carbon dioxide fire extinguishers – sodium cyanide will release toxic and flammable hydrogen cyanide gas in contact with these substances. Store away from chlorinating

agents – contact may form toxic cyanogen chloride gas. Exothermic reactions with oxidizing agents.

Section 11 – Toxicological Information

HEALTH EFFECTS

When handled in accordance with the guidelines in this safety data sheet, sodium cyanide 30 % solution should not present any health effects. If this product is mishandled, the following symptoms may develop:

Acute:

Sodium cyanide 30 % solution is a very toxic chemical asphyxiant – may cause death soon after exposure by all means of entry into the human body. It may cause caustic burns in contact with human flesh. Cyanide inhibits cytochrome oxidase preventing oxygen utilization leading to cytotoxic anoxia. . Acute effects depend on the degree of cellular hypoxia. Death results from central nervous system failure. Inhalation which cause weakness, headache, dizziness, shortness of breath, chest pain, confusion, cyanosis (bluish skin due to deficient oxygenation of the blood), weak and irregular heartbeat, collapse, unconsciousness, coma and death. Death can be very rapid. Ingestion will cause caustic burns, resulting in severe gastrointestinal tract irritation with nausea and vomiting, accompanied by severe burning sensation. Toxic amounts ingested may lead to poisoning symptoms similar for those for inhalation.

Inhalation:

Inhalation of sodium cyanide 30 % solution vapour – ammonia (NH_3) gas or hydrogen cyanide (HCN) gas above the solution - may result in burns and irritation to the nose and upper respiratory tract, leading to coughing and sore throat. Lesions of the nasal septum and delayed pulmonary oedema may result. Toxic amounts of HCN may be inhaled leading to poisoning symptoms which include weakness, headache, dizziness, shortness of breath, chest pain, confusion, cyanosis (bluish skin due to deficient oxygenation of the blood), weak and irregular heartbeat, collapse, unconsciousness, coma and death. Death can be very rapid. The lethal oral dose of HCN is estimated to be approximately 50 mg in an adult (Sullivan, J.B. Jr., G.R. Krieger (eds.), *Hazardous Materials Toxicology-Clinical Principles of Environmental Health*, Baltimore, Williams and Wilkins, 1992).

Human physiological response to various concentrations of hydrogen cyanide in air are summarised below:

HCN Level in		Duration in minutes	Resulting Conditions on Humans
mg/m^3	ppm		
2·2 - 5·5	2 - 5	-	"Bitter almonds" smell detectable by some people.
11	10	-	NOHSC peak limitation exposure standard.
19·8 - 39·6	18 -36	Several hours	Slight symptoms of cyanide poisoning.
48·5 -59·4	45 - 54	30 - 60 minutes	Tolerated without immediate or delayed effects.
121 - 148·5	110 - 135	30 - 60 minutes	Fatal, or dangerous to life.
148·5	135	30 minutes	Fatal.
199·1	181	10 minutes	Fatal.
297	270	Immediately	Immediately fatal.

(Simenova, F., Fishbein, L., Concise International Chemical Assessment Document 61, *Hydrogen Cyanide and Cyanides: Human Health Aspects*, International Program in Chemical Safety, Geneva, World Heath Organisation, 2004).

Skin:

Contact with sodium cyanide 30 % solution will cause severe irritation and chemical burns. Sweat increases rate of absorption into skin. Toxic amounts of sodium cyanide may be absorbed through the skin, leading to poisoning symptoms similar to those for inhalation. Toxicity tests: for sodium cyanide 30 % solution LD_{50} (Dermal, human/30 minutes) = 10 mg/kg (DSM Acrylonitrile B.V *Safety Data Sheet*, Ver. 5, 20/12/04); for sodium cyanide LD_{50} (Dermal, rat) = 33 mg/kg.

Eye:

Contact with sodium cyanide 30 % solution will cause severe irritation to the eye, leading to redness, pain and possible eye burns. May cause chemical conjunctivitis and corneal damage leading to loss of sight. Toxic amounts of sodium cyanide may be absorbed through the eye, leading to poisoning symptoms similar to those for inhalation.

Swallowed:

Sodium cyanide 30% solution is very toxic and may be fatal if swallowed. It will cause caustic burns, resulting in severe gastrointestinal tract irritation with nausea and vomiting, accompanied by severe burning sensation. Toxic amounts of sodium cyanide ingested may lead to poisoning symptoms similar for those for inhalation. The mean lethal dose by mouth of cyanide (CN^-) in an 80 kg male human adult is thought to be in the range of 50 to 200 mg and death is rarely delayed more than one hour (Gosselin *et al*, *Clinical Toxicology of Commercial Products*. 5th Ed., Baltimore: Williams and Wilkins, 1984). Toxicity tests: for sodium cyanide 30 % solution LD_{50} (Oral, rat) = 25 mg/kg (DSM Acrylonitrile B.V *Safety Data Sheet*, Ver. 5, 20/12/04); for sodium cyanide LD_{50} (Oral, rat) = 6·44 mg/kg.

Chronic:

Cyanide (CN^-) may be highly acutely toxic, but it has lower toxicity on a chronic basis. Prolonged or repeated exposure may cause drying of the skin, dermatitis, ulceration, skin necrosis, loss of appetite, weight loss, dizziness, shortness of breath, muscle cramps and irritation to upper respiratory tract. Chronic cyanide intoxication has been associated with such human diseases as retro tubular neuritis in pernicious anaemia, Leber's optic atrophy and Nigerian nutritional Neuropathy. Following long-term exposure at 15 ppm levels, individual cases of thyroid dysfunction have been reported (Barnerjee *et al*, Evaluation of cyanide exposure and its effect on thyroid function on workers in a cable industry, *J Occup Environ Med*., 39(3):258-260, 1997). As acutely toxic as cyanide is, repeated low-level doses of cyanide do not necessarily result in cumulative adverse effects.

Section 12 – Ecological Information

Ecotoxicity

Fish and aquatic invertebrates are very sensitive to cyanide (CN^-) exposure. Small concentrations, in the range of 5 to 20 mg CN^- per litre, causes a reduction in swimming performance, inhibiting reproduction and altering growth patterns. Increased cyanide concentrations in the range of 30 to 200 mg/L causes the deaths of many species of fish and invertebrates. Algae and macrophytes can tolerate much higher environmental concentrations of free cyanide than fish and invertebrates, but cyanide exposures may leave an aquatic plant community dominated by less sensitive species. Birds and higher mammals are susceptible to cyanide poisoning and display many symptoms associated with humans exposed to cyanide. The rapid recovery of some birds to sub-lethal doses of cyanide may be due to the rapid metabolism of cyanide to thiocyanate and its subsequent excretion. Cyanide has low persistence and is not accumulated or stored in any mammal studied.

Persistence and degradability

Potentially biodegradable by abiotic degradation. In aerobic conditions, microbial activity degrades cyanide ion (CN^-), in concentration up to 200 parts per million, to ammonia which then oxidises to nitrate (NO_3). Biological degradation may also occur under anaerobic conditions, but CN^- concentrations of more than 2 ppm are toxic to anaerobic micro organisms. Hydrogen cyanide may be hydrolysed to formic acid or ammonium formate- this reaction is not fast but may be appreciable faster in anaerobic conditions such as ground water.

- Water/Soil – in soils cyanide ion (CN^-) migrates easily to ground water and at high concentrations is toxic to soil micro organisms;
- Groundwater – persists in groundwater due to lack of sunlight/oxygen needed to degrade it to benign forms.

Mobility

- Air – HCN present as gas – duration 1-3 years before settling out;

In alkaline conditions, due to the presence of 0·4 % ($^{wt}/_{wt}$) free sodium hydroxide in sodium cyanide 30 %

solution:

- Water – considerable solubility and mobility – at surface water interface cyanide ion (CN^-) oxidises in the presence of sunlight and oxygen to yield cyanate ion (CNO^-), thiocyanate ion (SCN^-), ammonia, nitrate (NO_3) and various other compounds;
- Soil/Sediments – adsorption on minerals soil constituents possible - most persistent in groundwater and at higher pH.

Environmental fate (exposure)

Acute ecotoxicity:

Fish: 96 hr LC_{50} (Oncorhyncus mykiss): 0·1 mg/L, (as sodium cyanide 30% solution); in fresh water conditions*;

Crustaceans: 48 hr EC_{50} (Daphnia magna): 0·1 mg/L, (as sodium cyanide 30% solution), in fresh water conditions*;

Fish: 96 hr LD_{50} (Oncorhyncus mykiss): 0·028 mg/L, (as cyanide); in fresh water conditions at 6 °C;

Fish: 96 hr LD_{50} (Perca flavescens): 0·076 - 0·108 mg/L, (as cyanide); in fresh water conditions;

Fish: 96 hr LD_{50} (Pimephales promolas): 0·082 - 0·113 mg/L, (as cyanide); in fresh water conditions;

Crustaceans: 96 hr LD_{50} (Daphnia magna): 0·16 mg/L, (as cyanide), in fresh water conditions;

Soil organisms: 96 hr EC_{50} (Lumbriculus variegatus): 11 mg/L, (as cyanide);

Terrestrial plants: 32 days EC_{50} (Pimephales promolas): 22·4 mg/L, (as cyanide);

Birds: 96 days EC_{50} (Lymnaea luteola): 2·5 mg/L, (as cyanide).

* DSM Acrylonitrile B.V *Safety Data Sheet*, Ver. 5, 20/12/04

Bioaccumulative potential

Low potential for human bioaccumulation. Does not bioaccumulate in fish.

Section 13 – Disposal Considerations

Disposal methods and containers

Due to its inherent properties, hazardous conditions may result if material is managed improperly. Dispose of all contained and contaminated spill residue in accordance with the requirements of the Department of the Environment. Contact CSBP Limited for technical advice on disposal method.

As required under the ADG Code treat empty containers as filled containers.

Special precautions for landfill or incineration

No data available

Section 14 – Transport Information

UN Number

3414

UN Proper shipping name

Sodium Cyanide Solution

Class and subsidiary risk

Class 6.1 Toxic. No subsidiary risk.

Packing group

I

Special precautions for user

Transport in accordance with Australian Code for Transport of Dangerous Goods by Road and Rail (ADG Code).

Hazchem code

2X

Section 15 – Regulatory Information

Australian regulatory information

SUSDP Poison Schedule 7. Licensing is required for this chemical in all States and Territories.

Listed on the Australian Inventory of Chemical Substances (AICS).

Additional national and/or international regulatory information

OSHA: Hazardous by definition of Hazard Communication Standard (29CFR 1910.1200).

This product is subject to the EC directive 82/501/EEC and amendments.

Classifications

Safework Australia criteria is based on the Globally Harmonised System (GHS) of Classification and Labelling of Chemicals.

The classifications and phrases listed below are based on Approved Criteria for Classifying Hazardous substances [NOHSC: 1008(2004)].

Hazard Codes	N	Dangerous for the environment.
	T	Toxic
	T+	Very toxic.
	Xi	Irritant.
Risk Phrases	R26/27/28	Very toxic by inhalation, in contact with skin and if swallowed.
	R32	Contact with acids liberates very toxic gas.
	R38	Irritating to skin
	R41	Risk of serious damage to eyes.
	R48/23/24/25	Toxic: danger of serious damage to health by prolonged exposure through inhalation, in contact with skin and if swallowed.
	R50/53	Very toxic to aquatic organisms, may cause long-term adverse effects in the aquatic environment.
Safety Phrases	S1/2	Keep locked up and out of reach of children.
	S7	Keep container tightly closed.
	S28	After contact with skin, wash immediately with plenty of water.
	S29	Do not empty into drains.
	S45	In case of accident or if you feel unwell seek medical advice immediately (show the label where possible).
	S60	This material and its container must be disposed of as hazardous waste.
	S61	Avoid release to the environment. Refer to special instructions/safety data sheets.

Inventory listing(s)

AUSTRALIA: AICS (Australia Inventory of Chemical Substances)

All components are listed on the AICS; or are exempt.

Section 16 – Other Information

Key / legend to abbreviations and acronyms used in the MSDS

NOEC	No Observable Effect Concentration - concentration where no effect can be seen
NOHSC	National Occupational Health and Safety Commission
SUSDP	Standard for the Uniform Scheduling of Drugs and Poisons
EC_{50}:	Environmental concentration 50. The concentration of a material, in ppm or ppb, in the environment (usually water) a single dose of which is expected to cause a biological effect on 50% of a group of test animals.
ES-TWA	Exposure Standard – Time weighted average
ES-STEL	Exposure Standard – Short term exposure level

ES-Peak	Exposure Standard – Peak level
FORS	Federal Office of Road and Safety
LC_{50}:	Lethal concentration 50, median lethal concentration
LD_{50}	Lethal dose 50. The single dose of a substance that causes the death of 50% of an animal population from exposure to the substance by any route other than inhalation
$\%(^{wt}/_{wt})$	Percent amount on a weight per weight basis
$\%(^{wt}/_{vol})$	Percent amount on a weight per volume basis
PPM	Parts per million
Zone 1 Class 1	An area where an explosive gas atmosphere can be expected to occur periodically or occasionally during normal operation. (More than 10 hours per year but less than 1000 hours per year)

Literature references

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Guidance for the Compilation of Safety Data Sheets for Fertilizer Materials, European Fertilizer Manufacturers Association, online at www.efma.org/Publications/Guidance/Index.asp

Sources for data

No data available

Important Notes

1. To the best of our knowledge this document complies with the Code of Practice for the Preparation of Safety Data Sheets for Hazardous Chemicals, Safe Work Australia, December 2011.
2. This safety data sheet summarises our best knowledge of the health and safety hazard information of the product and how to safely handle and use the product in the workplace. Each user should read this safety data sheet and consider the information in the context of how the product will be handled and used in the workplace, including in conjunction with other products.
3. If clarification or further information is needed to ensure that an appropriate risk assessment can be made, the user should contact the Safety Department, CSBP Limited on (08) 9411 8777 (Australia), +61 8 9411 8777 (Overseas).
4. Our responsibility for products sold, is subject to our terms and conditions, a copy of which is sent to our customers, and is also available on request.
5. CSBP reserves the right to make change to l safety data sheets without notice.