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Draft Indian Standard

SODIUM HYPOCHLORITE– CODE OF SAFETY

ICS 13.300; 71.060.50

Chemical Hazards Sectional Committee, CHD 07	**Last date of comments**: Please see Covering letter

FOREWORD

(Formal clause to be added later)

Sodium Hypochlorite is an inorganic chemical widely used as bleach liquor and is generally sold in aqueous solutions containing 5 to 15 percent sodium hypochlorite, with 0.25 to 0.35 percent free alkali (usually NaOH) and 0.5 to 1.5 percent of chloride as NaCl.

This standard prescribes properties of sodium hypochlorite, the nature of hazards associated with it and essential information on storage, handling, packing, labelling, waste disposal, cleaning of containers, selection and training of personnel, protective equipment and first aid.

Safety measures mentioned in the standard for controlling hazards, essential information on symptoms of poisoning due to exposure to Sodium Hypochlorite, personal protection equipment, etc. have been harmonised with the latest and applicable statutory rules.

There is no 1SO Standard on this subject. In the preparation of this standard considerable assistance was derived from Sodium Hypochlorite Safety Data Sheet issued by reputed Indian and International bleach Liquor manufacturers.

The various clauses of the standard are in line with the format being applied for all Indian Standards on Code of safety of chemicals.

1 SCOPE

1.1 This standard describes the properties of sodium Hypochlorite and nature of hazards associated with it. The standard prescribes safety measures for controlling hazards and essential information on symptoms of poisoning, first-aid, medical treatment, storage, handling, labelling and employee safety.

1.2 The standard does not, however, deal with specifications for design of buildings, chemical engineering plants, method and ingredients used in the manufacture, equipment for waste disposal and operation control.

2 REFERENCES

The Indian Standards listed below contain provisions which through reference in this text, constitute provisions of this standard. At the time of publication, the editions indicated were valid. All standards are subject to revisions, and parties to agreements based on this standard are encouraged to investigate the possibility of applying the most recent editions of the standards:

IS No.	*Title*
4155: 1966	Glossary of terms relating to chemical and radiation hazards and hazardous chemicals
8519: 1977	Guide for selection of industrial safety equipment for body protection
8520: 1977	Guide for selection of industrial safety equipment for eye, face and ear protection
8807: 1978	Guide for selection of industrial safety equipment for protection of arms and hands
10667: 1983	Guide for selection of industrial safety equipment for protection of foot and leg

3 TERMINOLOGY

For the purpose of this standard the definitions given in IS 4155 shall apply.

4 PROPERTIES

4.1 General Information

Sodium hypochlorite is a chemical compound with the formula NaOCl comprising a sodium cation (Na^+) and hypochlorite anion (OCl^-). It may also be viewed as the sodium salt of hypochlorous acid.

Sodium hypochlorite is a household chemical widely used as a disinfectant or a bleaching agent. In solution, the compound is unstable and easily decomposes, liberating chlorine which is the active principle of such products.

Its corrosive properties, common availability, and reaction products make it a significant safety risk. In particular, mixing liquid bleach with other cleaning products, such as acids or ammonia, will produce chlorine gas which is poisonous.

4.1.1 *Chemical Name* – Sodium hypochlorite

4.1.2 *Common Name & Synonyms* – Bleach, liquid bleach, hypochlorite, sodium salt, sodium oxychloride.

4.1.3 *Uses*
Sodium hypochlorite solution is used in textile and paper bleaching, laundry trade, sterilization of swimming pools, disinfection of drinking water, treatment of cyanide wastes of electroplating industry and treatment of sewage effluent. It is also used as a sanitizer and deodorizer for floors, sinks and toilets, as a therapeutic adjunct in the treatment of certain skin diseases and as a safe antiseptic.

4.2 Identification

4.2.1 *Formula* ─ NaOCl, NaClO

4.2.2 *CAS Number* ─ 7681-52-9

4.2.3 *UN Number* ─ 1791

4.2.4 *UN Hazard Class* ─ 8

4.2.5 *Hazchem Code* ─ 2X, Packing Group ─ III

4.3 Physical Properties

4.3.1 *General*

A dilute solution of Sodium Hypochlorite is commonly known as bleach. Colour of bleach liquor is green to yellow. It can be crystallized as a pentahydrate $NaOCl.5H_2O$, a pale greenish-yellow solid which is not explosive and is stable if kept refrigerated.

The anhydrous compound is unstable and may decompose explosively. It decomposes at above 40 °C on heating. Sodium Hypo releases poisonous chlorine gas on contact with acids. Sodium hypochlorite is light sensitive and incompatible with strong acids, amines, ammonia, ammonium salt, reducing agents, metals, aziridine, methanol, formic acid, phenyl acetonitrile. It is completely soluble in water and reacts with many organic solvents.

4.3.2 *Molecular Mass* ─ 74.44 gm/mol

4.3.3 *Physical State* ─ Liquid

4.3.4 *Colour* ─ Water clear to a slight greenish-yellow or light yellow

4.3.5 *Odour* ─ chlorine like and sweetish odour

4.3.6 *Boiling Point* ─ 111°**C**

4.3.7 *Melting point/freezing point* ─ (-)25 °C

4.3.8 *Vapour Density (Air = 1)* ─ 1.2

4.3.9 Specific *Gravity*

a) Solid (water = 1) – Not Available

b) Liquid (water = 1) ─ 1.126 (8 percent w/w Cl_2 solution);
1.163 (10 percent w/w Cl_2 solution);
1.202 (12 percent w/w Cl_2 solution); and
1.25 (15 percent w/w Cl_2 solution)

4.3.10 *Viscosity*

a) Kinematic viscosity 2.222 mm^2/s at 20 °C

b) Dynamic viscosity 2.8 mPa s at 20 °C

4**.3.11** *Vapour pressure at 20 °C* ─ 20 mmHg

4.3.12 *Heat of Combustion* ─ Not Available

4.3.13 *Refractive Index at 25 °C* ─ 1.3870

4.3.14 *Solubility in Water* ─ 29.3 g/100ml (0 °C), completely soluble

4.3.15 *Solubility in other solvents* ─ Reacts with many organic solvents

4.3.16 *Light Sensitivity* ─ Light sensitive. Degrades on exposure to UV light.

4.4 Chemical Properties

4.4.1 *Reactivity*

Generally, Salts of hypochlorous acid (HClO) are toxic, irritants and powerful oxidizers, particularly in the presence of water or at higher temperature as they decompose to release oxygen and chlorine gases. On contact with urea, they form highly explosive nitrogen trichloride (NCl3) which is highly explosive. On contact with acids, they produce highly toxic fumes of chlorine gas. Reacts with sulphuric acid to produce heat and chlorine gas. Sodium hypochlorite reacts violently with amines and ammonium salts. Sodium Hypochlorite solutions are reactive with common cleaning products such as toilet bowl cleaners, rust removers, vinegar, acids, organics and ammonia products to produce hazardous gases such as chlorine and other chlorinated species.

4.4.2 *Polymerisation* ― Not available.

4.4.3 *Allotrope Formation* ― Not available.

4.4.4 *Corrosion Properties*

Sodium Hypochlorite is known to be corrosive to metals. It will generate hydrogen gas when in contact with aluminium. Sodium Hypochlorite solutions are corrosive to eyes, skin and mucous membranes.

4.5 Fire and Explosion Hazard Properties

4.5.1 *Ignition Temperature* ― Not available.

4.5.2 *Auto Ignition Temperature* ― Not available**.**

4.5.3 *Flash Point* ― Not applicable, this product does not flash.

4.5.4 *Upper Explosive Limit* ― Not available.

4.5.5 *Lower explosion limit* ― Not available.

4.5.6 *Fire Risk*

Sodium hypochlorite is non-flammable but is decomposed by heat and light, causing a pressure build-up which could result in an explosion. When heated, it may release chlorine gas or hydrochloric acid. Vigorous reaction with oxidisable or organic materials may result in fire.

5 HEALTH HAZARD & TOXICITY INFORMATION

5.1 General Information

Sodium hypochlorite and its fumes are known to have both acute and chronic health effects. The health affect can be dermal, respiratory and eye injury. Fatal exposure can occur by inhalation of high dose of chlorine. Exposure to Sodium Hypo can be prevented by taking proper safety precautions in its handling.

5.2 Routes of entry

5.2.1 *Skin*

Contact of Sodium Hypochlorite with skin may cause dermal irritation

5.2.2 *Eyes*

Contact of Sodium Hypochlorite with eyes may cause severe irritation leading to eye damage, especially at higher concentration.

5.2.3 *Ingestion*

Ingestion of Sodium Hypochlorite solution will cause burning of mouth, nausea, vomiting, delirium and coma

5.2.4 *Inhalation*

Inhalation of Sodium hypochlorite vapour may cause irritation to the respiratory tract, nose and throat. Symptoms may include coughing and sore throat, bronchial irritation and pulmonary edema.

5.3 Toxicity information

Available toxicity values are given below:

a)	TLV (TWA):	0.5 ppm as Cl_2
b)	STEL (ACGIH):	1 ppm as Cl_2
c)	IDLH:	10 ppm as Chlorine
d)	LD50 (rat), Dermal:	2000 mg/kg
	LD50 (rat), Oral:	89.10 mg/kg (100% Sodium Hypochlorite)
e)	LDL_o (human) Oral:	Not available
f)	LC (Rat), Inhalation:	More than 10.5mg/kg
g)	Carcinogenicity:	Not considered to be carcinogenic
h)	Reproductive Toxicity:	Not Available
i)	Mutagenicity:	Not Available

5.4 Antidote

No specific antidote available.

5.5 Health Effects

5.5.1 *Signs and Symptoms*

Inhalation of Sodium hypochlorite vapour will cause wheezing, shortness of breath, headache, spasm, inflammation and edema of bronchi, pneumonitis. Ingestion of solution will cause burning of mouth, nausea and vomiting, delirium, coma. Contact of solution or vapour with the eyes will cause Redness, tearing, itching, and burning of the eyes. It may damage cornea, cause conjunctivitis and loss of vision. Exposure to skin will result in redness, blistering, burning, itching, and tissue destruction with slow healing.

5.5.2 *Acute Toxicity*

Liquid or spray mist may produce tissue damage particularly on mucous membranes of eyes, mouth and respiratory tract. Prolonged exposure may result in skin burns and ulcerations. Skin

inflammation is characterized by itching, scaling, reddening, or occasionally blistering. Inhalation of the spray mist may produce severe irritation of respiratory tract, characterized by coughing, choking, or shortness of breath. Inflammation of the eye is characterized by watering and itching.

5.5.2.1 *Systemic effects*

Systemic toxicity is rare, but metabolic acidosis may occur after ingestion.

5.5.2.2 *Local effects*

Ingestion of Sodium Hypochlorite may cause burns to the mouth and throat, gastrointestinal irritation, nausea, vomiting and diarrhoea. Inhalation and ocular exposure to Sodium hypochlorite vapour results in burning of throat and lungs, eye and nose irritation, chest tightness, coughing and sore. Sodium Hypochlorite is corrosive and may irritate the skin or cause burning pain, inflammation and blisters**.**

5.5.3 *Chronic Toxicity*

Prolonged or extensive exposure may cause skin irritation and damage to the skin such as thickening, blackening or cracking. Repeated eye exposure may cause corneal erosion or loss of vision. If overexposed to the solution, there will be constant irritation of the eyes, nose, and throat. Over-exposure by inhalation may cause respiratory irritation and bronchitis.

5.5.3.1 *Systemic effects*

Systemic toxicity is rare.

5.5.3.2 *Local effects*

May cause severe burns and eye damages.

6 PERSONAL PROTECTIVE EQUIPMENT

6.1 Availability and Use

PPE is a device/appliance designed to be worn by an individual when exposed to one or more health and safety hazards. Personal Protective Equipment (PPE) are tools that ensure the basic health protection and safety of users but not a substitute for good engineering control such as safe working conditions and adequate ventilation. Two Types of PPEs are in use, namely, Respiratory PPE for protection of respiratory system and non-respiratory PPE for protection of head, eye, skin, foot, etc.

Employers should assess the workplace where Sodium Hypo is handled to assess if any health hazards are present or are likely to be present in the work area. In that case, the employers must select and provide proper PPE to employees and also ensure its use by the employee while doing work. Employees should be trained on all aspect of PPE including its selection, use, cleaning after use, proper care, maintenance and storage.

6.2 Non-Respiratory Equipment

6.2.1 *Eye and face Protection*

Where there is a reasonably foreseeable risk of eye injury, suitable goggles (splash resistant chemical safety goggles) eyecup or cover types eye protectors should be worn. If protection to the whole face including mouth, nose and eyes is required, face shield should be used. Maintain eyewash and drench shower equipment in work area (*see* IS 8520)

6.2.2 *Head Protection*

Protective hats are used for head protection against impact blows and in some case electric shock. Class C hard hats can be used for handling Sodium Hypochlorite but it does not offer electrical protection (*see* IS 8807)

6.2.3 *Foot and leg Protection*

Workers should use appropriate foot guards, safety shoes, or Rubber boots for protection of feet and legs (*see* IS 10667)

6.2.4 *Body, Skin and Hand Protection*

Employees should wear protective clothing made from rubber, vinyl, neoprene or PVC when handling Sodium Hypochlorite solution. Protective clothing includes full-length gloves, aprons, gowns, coveralls and boots. Employees should also wear Standard work clothing closed at the neck and wrist while wearing impervious equipment. Protective clothing protects the skin or personal clothing from contact with Sodium Hypochlorite solution and prevents spread of contamination. Contaminated clothing should be removed and discarded or laundered (*see* IS 8519)

6.3 Respiratory Protection

Respiratory protective equipment (RPE) protects workers against exposure to dusts, gases, fumes and vapours. The choice of RPE depends on the air contaminants concentration, duration of exposure and physical and chemical nature of the chemical handled.

Respirator Selection should be done on the basis of Assigned Protection Factors (APFs).Maximum Use Concentrations (MUCs) from which an employee can be expected to be protected when wearing a respirator,is determined by multiplyingthe APF for the respirator by the exposure limit.

Two types of Respiratory Protective Equipment available, namely, Air Purifying Respirator (Filtering Device) and Airline Respirators (Breathing Apparatus).

a) *Respirator (filtering device)* – Uses filters to remove contaminants in the workplace air, there are two main types: Non-powered respirators & Powered respirators.

b) *Breathing apparatus (BA)* – Needs a supply of breathing-quality air from an independent source (e.g. air cylinder or air compressor)

6.3.1 Respiratory Equipment

Respirator selection (upper limit devices).

a) 1 mg/m^3 — Chemical cartridge gas Mask Respirator with a full face-piece.

b) 2.5 mg/m^3 — (i) Power air-purifying respirator
(ii) Supplied air respirator operated in a continuous flow mode.

c) 5 mg/m^3 — (i) Supplied air Respirator with a full face-piece/ SBA
(ii) Air purifying full face-piece respirator.

d) 200 mg/m^3 — Supplied air respirator with a full face-piece and operated in a pressure demand or other positive pressure mode.

e) Emergency or planned entry in unknown concentration
Self-Containing Breathing Apparatus (SCBA) with full face-piece and operated in a pressure demand or positive pressure mode.

f) Escape Gas mask (i) Air purifying full face-piece respirator
(ii) Self-contained breathing apparatus.

7 STORAGE, HANDLING, LABELLING AND TRANSPORTATION

7.1 General

Sodium hypochlorite solution is corrosive to eyes, skin and mucous membranes. All persons should be trained in handling of Sodium Hypochlorite and should wear appropriate personal protective equipment.

7.2 Storage

7.2.1 Sodium Hypochlorite should be stored away from direct sunlight in shaded area at temperatures below 15°C. pH of Sodium Hypochlorite solution should be maintained above 10. Large storage areas should have appropriate ventilation. No other material should be stored along with Sodium Hypochlorite

7.2.2 *Tank for storing sodium hypochlorite solution*

Sodium hypochlorite solution is stored in polyethylene, HDPE, XLPE (Cross-linked polyethylene), FRP (Fiberglass reinforced plastic), and chlorobutlyl rubber-lined steel storages Tanks. Storage tanks may be insulated with polyurethane foam or cellular glass to keep the product cool to prevent decomposition. Secondary containment in the storage area is required to contain the Sodium Hypo solution in case of leak or accidental spillage.

7.3 Handling

Contact of Sodium Hypochlorite with eyes, skin or clothing should be avoided. Containers should be labelled and kept closed and protected from physical damage. Containers should be checked regularly for leaks or spills.

7.3.1 *Piping*

Structural strength and chemical resistance are the two factors which determine the selection of piping materials for Sodium Hypochlorite solutions. Steel pipe lined with polypropylene, PVDF, PTFE, or similar thermoplastics may be used where piping systems may be subject to physical stress. Fiberglass, CPVC and PVC is suitable for piping system in lighter stress situations.

7.3.2 *Valves* ― PTFE or PVC lined quarter-turn plug or ball valves are recommended for service.

7.3.3 *Pumps* ― Titanium or plastic lined pumps are recommended for service.

7.3.4 *Venting/Overflow System*

To eliminate excessive pressure or vacuum while filling or discharging the tank, a venting system must be provided. Piping should be installed to direct the overflowing solution away from personnel into a containment area.

7.3.5 *Gauging Devices*

Storage tanks should have a level indicating device for measuring liquid level. An independent, back up level sensor should be used to prevent tank overflow in the event of a level gauge failure

7.4 Labelling

7.4.1 *General* **–** Each container should carry an identifying label /placard. Tank cars should have emergency information panel as required by regulations.

7.4.2 The storage containers shall be labelled or marked to identify:
(a) The contents of the container;
(b) The name and address of the manufacturer or importer of the hazardous chemical; and
(c) The physical, chemical and toxicological data as per the criteria given in the relevant Schedule of the Manufacture, Storage and Import of Hazardous Chemicals Rules 1989. While referring to the statutes, the stipulations given in the subsequent amendments of those statutes shall be taken into account.

7.5 Transport

Customers should handle and unload sodium hypochlorite containers safely and must comply required add regulations for the same.

Tank Cars are used for bulk transportation of Sodium Hypochlorite. For small quantities, containers with capacities of 500 ml to 20 l are usually used.

7.5.1 *Unloading of Tankers*

Unloading of Sodium Hypochlorite solution from the tank car to customers' storage tank can be done by any one of the following methods :
a) By Gravity;
b) By Pumping; and
c) By compressed Air.

The truck should be placed accurately and levelled. Stoppers/pegs should be used to avoid movement of truck during unloading. Supplier's instructions for unloading should always be

followed and all caution markings on both sides of trucks should be read and observed. Unloading stations should be equipped with safety showers

7.5.2 *Unloading Drums/Carboys*

Carboys should not be dropped or allowed to strike each other and shall be unloaded on the pallet. Proper PPEs should be used while unloading.

7.5.3 *Driver*
Trained drivers possessing valid driving license should only transport Sodium Hypochlorite tank cars. Driver should carry TREM card when vehicle is on road.

7.5.4 If transport of the hazardous chemical is involved it shall be carried out in accordance with the Central Motor Vehicles Rules, 1989. While referring to the statutes, the stipulations given in the subsequent amendments of those statutes shall be taken into account.

8 SPILLAGE, LEAKAGE AND WASTE DISPOSAL

8.1 General

All personal attending to control spill/leak should use proper personal protective equipment while handling Sodium Hypochlorite.

8.2 Spillage

8.2.1 *General Information*

General public should be prohibited to not enter into the affected area. Unrelated and unprotected personnel should be kept away from the affected area and be advised to stay upwind of spill area. Avoid Contact with spilled product.
Prevent entry of Spilled Sodium hypochlorite into sewers, open drains and waterways. Notify the incident to proper authorities. Carefully plan response and proceed with caution.

8.2.2 *Land Spill (Spill on land)*

8.2.2.1 *Containment*

Sodium hypochlorite solution spilled on land may be contained by building dykes or barrier using earth, and or similar inert materials. Recover spilled Sodium hypochlorite as much as possible and cover the spilled area with sand.

8.2.2.2 *Consequence*

Chlorine gas will be released from the spilled Sodium hypochlorite and can affect human beings, animals and environment of the surrounding area. Chlorine gas may travel further in the down wind direction if large quantity of Sodium hypochlorite leaks.

8.2.2.3 *Mitigation*

The contaminated soil from the spilled area should be removed and send it to hazardous waste disposal site

8.2.3 *Water Spill (Spill on Water)*

8.2.3.1 *Containment*

Spilled sodium hypochlorite will mix with water and chlorine will be liberated. Chlorine can be neutralised with Sodium sulphite, Sodium bisulphite, Sodium thiosulfate, hydrogen peroxide, and sulphur dioxide.

8.2.3.2 *Mitigation*

In case of spillage of large quantity of sodium hypochlorite into water body, the water of the affected water body may be unfit for consumption and may affect the aquatic life because of high chlorine content. Stop use of contaminated water. Notify proper authorities to stop water intake or to monitor water for contamination.

8.3 Leakages

8.3.1 *General Information* ─ In case of a spill or leak, stop the leak as soon as possible.

8.3.2 *Leak from the Truck* ─ The leaking tanker should be emptied out to another empty tanker or to a storage tank.

8.3.3 *Caution* ─ Persons handling leaking Sodium Hypo Tankers should wear proper personal protective equipment.

8.4 Waste Disposal

8.4.1 Contaminated Sodium Hypochlorite solutions should be neutralised with any of the neutralizing chemicals such as **S**odium Sulphite, Sodium bisulphite, Sodium thiosulfate, Hydrogen Peroxide or Sulphur dioxide. The neutralised waste Sodium hypochlorite can be discharged to effluent treatment plant or sewers.

8.4.2 Soils contaminated with Sodium hypochloite should be disposed as hazardous waste.

8.4.3 Returnable carboys/jars should be thoroughly washed inside and outside with water before returning. Non-returnable containers, before scrapping should be thoroughly washed with water.

9 FIRE PREVENTION AND FIRE FIGHTING

9.1 General Information

Sodium hypochlorite is not combustible but is a strong oxidizer which enhances the combustion of other substances. During a fire, irritating and highly toxic gases such as Sodium Oxide and Chlorine may be generated by thermal decomposition or combustion. Wear proper protective equipment including respiratory protection while entering fire area. Wear a self-contained breathing apparatus (SCBA) and full protective gear to prevent contact with thermal decomposition products and also wear appropriate protective clothing to prevent contact with skin and eyes.

9.2 Prevention

9.2.1 Fires are controlled by exclusion of air, using water spray, dry chemical and carbon dioxide extinguishers. In case of fire in the surroundings, extinguish fire using appropriate extinguishing media suitable for type of surrounding fire. Use water in flooding quantities as fog. Use water spray to keep fire-exposed containers cool.

9.2.2 Move container from fire area if without risk. Apply water from as far a distance as possible to keep fire-exposed containers cool

9.3 Fire-fighting

Use water spray, dry chemical, carbon dioxide, or appropriate foam. Do not use a heavy water stream. Use water spray or fog for cooling exposed containers.

10 TRAINING

10.1 Safety in handling of sodium hypochlorite depends upon the effectiveness of employee education, training and supervision. Employee education and training should emphasize the need of handling sodium hypochlorite according to the methods outlined in the manual/work instruction. Employees should be trained to prevent spilling or splashing, leaks, inhalation of the vapour or ingestion.

10.2 All new employees should be instructed thoroughly for proper handling of sodium hypochlorite before being placed on the job. Older employees should be re-instructed periodically.

10.3 Each employee should know the location where PPE is stored. Also the employees should be aware of the locations of safety showers, fountains for flushing the eyes provided within the

plant. Employees should be trained for use of various PPEs and the purpose of their use. Employees should also be trained for the maintenance and upkeep of PPEs.

10.4 Only reliable, dependable and properly trained employees should be given the responsibility of all operations involving storage, handling, transport and emergency management involving sodium hypochlorite.

10.5 Employees should be instructed to report to the proper authority/immediate supervisors regarding any suspected leaks or equipment failure. Each employee should be trained on emergency procedures and the first-aid measures. Employees should be trained to apply first-aid in case of contact with or exposure to sodium hypochlorite vapour.

11 HEALTH MANAGEMENT, FIRST-AID AND MEDICAL TREATMENT

11.1 Health Monitoring

11.1.1 *Personal Hygiene*

It is desirable that employees should bathe daily after finishing their work. Employees should report to medical department if they observe any abnormal condition in their skin, eye, chest or if they experience any difficulty in their respiratory system (breathing, coughing, etc.)

11.1.1.2 Employees should neither store nor eat food in the sodium hypochlorite storage and handling area.

11.1.2 *Examinations*

11.1.2.1 *Pre-placement medical examination*

Pre-placement medical examination is directed towards eliminating workers suffering from bronchitis or other respiratory diseases to work in the sodium hypochlorite work environment.

11.1.2.2 *Medical examination*

All employees working in the Sodium Hypochlorite work environment should undergo routine annual medical examination. In addition to routine medical check-up, Chest X ray should also be done on annual basis for employees who are over exposed to sodium hypochlorite.

11.2 First Aid

11.2.1 *General*

First-aid treatment should be started at once in all cases of contact with sodium hypochlorite; serious injury may result if delayed. All affected persons should be referred to a physician even when the injury appears to be slight. Physician should be given detailed account of the accident. If the affected person is unconscious, do not give anything by mouth. First aiders are at risk of

exposure to sodium hypochlorite and therefore the first aiders should wear proper PPEs when attending to affected persons

11.2.2 *Contact with Skin*

Take off all contaminated clothing and rinse skin immediately with plenty of water for 15-20 min. If irritation persists, repeat flushing. Call a physician/ doctor for treatment & advice. Share the product label or material safety data sheet (MSDS) with the physician for medical treatment. Wash contaminated clothing before reuse.

11.2.2.1 *Contact with Eyes*

Hold eye open and rinse slowly and gently with plenty of water for 15-20 min. Remove contact lenses, if present, after the first 5 min, then continue rinsing eye for 10-15 min. Call a medical physician/doctor for further treatment and advice.

11.2.2.2 *Ingestion*

Do not induce vomiting. Get medical aid immediately. If victim is conscious and alert, give 2-4 cupful of milk or water if able to swallow. Dilute immediately by giving milk, melted ice cream, starch paste or antacids such as milk of magnesia. Avoid Sodium bicarbonate because of carbon dioxide release. Do not give anything by mouth to an unconscious person. If spontaneous vomiting occurs, have victim lean forward with head down to avoid breathing in of vomitus, rinse mouth and administer more water.

11.2.2.3 *Inhalation*

Get medical aid immediately. Remove from exposure and move to fresh air immediately. Assure fresh air breathing. Allow the victim to rest. If not breathing, give artificial respiration. If breathing is difficult, oxygen to be administered by trained person. If person is not breathing, call an ambulance. Give artificial respiration, preferably mouth-to-mouth if possible. Call a poison control centre or medical physician for further treatment & advice.

NOTE - While consulting Doctor or Medical person for further treatment medical advice share the MSDS and product Label.

11.2.3 *First-Aid Kit*

First-Aid kit should contain the following items in addition to items normally kept in the first-aid kit.

a) 0.5 per cent silver nitrate solution,
b) Sofratulle sterilized gauzes, and
c) Silver sulpha ointment. (If patient is not allergic to sulpha drugs)

Basic first-aid manual or instruction booklet may be kept in the first-aid kit. The medicines kept in the first-aid kit should be checked regularly for expiry date and replace as required.

11.3 Medical treatment

Pre-existing medical conditions may be aggravated by exposures affecting target organs. Probable mucosal damage may contraindicate the use of gastric lavage. In addition to the alkalinity of this product, the continued generation of chlorine gas after ingestion can damage further the stomach mucous, depending on the amount ingested. Consideration may be given to removal of the product from the stomach, taking care to avoid perforation of oesophagus or stomach. An ounce of 1% Sodium thiosulfate or milk of magnesia is helpful. Physician should treat symptomatically and supportively

11.3.1 Treat skin burns by cleaning the affected area with soap and water.

11.3.2 If bleach gets into the eyes, the person should first flush the eyes with water and then seek medical attention

12. ADDITIONAL INFORMATION

Sodium Hypochlorite is classified as a Class 8 Dangerous Good. When handling concentrated Sodium Hypochlorite solutions, appropriate precautions should be taken. Very serious allergic reaction to Sodium Hypo is unlikely, but if it occurs seek immediate medical attention. Symptoms of a serious allergic reaction may include rash, itching/swelling (especially of the face/tongue/throat), severe dizziness, trouble in breathing. Unauthorised and untrained employees should not be permitted in areas where Sodium Hypo is being handled.