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(*IS 7415* □□□□ □□□□□□□□□)

Draft Indian Standard

ANILINE — CODE OF SAFETY

(*First Revision of IS 7415*)

ICS 71.080.30 ,71.080.15

Chemical Hazards Sectional Committee, CHD 07

Last date for Comments: 24.11.2025---

FOREWORD

(*Formal clauses shall be added later*)

Aniline is an important organic chemical used in the manufacture of dyes, medicines, resins, varnishes, perfumes, shoe polishes, etc., in vulcanizing rubber and as a solvent. It is highly toxic and is flammable. Intoxication may occur from inhalation, ingestion or by absorption through direct skin contact. The most common modes of accidental poisoning are spillage of the liquid on the skin or clothing leading to direct skin contact or the prolonged inhalation of vapour under circumstances of inadequate ventilation. The threshold limit in air by volume is 2 ppm, but the odour of aniline can usually be detected in concentrations of 0.5 ppm, thus providing a good warning margin. Observance of this code safety will reduce the frequency of hazard. Aniline is chemically also known as amino benzene or phenyl amine. Commercially it is known as aniline oil because of its oily appearance.

The elimination of accidents is vital to public interest. Accidents produce economic and social loss, and impair individual or group productivity. Realization of this loss has led the authorities to devote a good deal of attention to safety education. In any programmed of safety education, preparation of code of safety is an essential part. Apart from general precautions, some typical precautions are required to be taken and this code of safety lays special emphasis on these points. For, proper utilization of the code of safety for aniline, a knowledge of effects of hazardous substances on biological systems is desirable. This code of safety recommends practices to be followed to ensure safety of personnel engaged in industries where aniline is produced, stored, handled or used.

The properties of aniline listed in Clause **4** have been taken from literature and have been included for information only. BIS has published a separate standard IS 2833: 2019 on the requirements and the methods of sampling and test for aniline intended for industrial purposes.

This standard was originally published in 1974. The Committee felt a need to revise this standard with a view to update the standard based on the experience of last five decades and on the currently available data.

In this revision general properties have been incorporated and modifications have been made to update safety measures for controlling hazards and essential information on symptoms of poisoning, first-aid, medical treatment, storage, handling, labelling and employee safety.

There is no standard on this subject published by ISO. This standard has been prepared indigenously based on the available data and information.

The various clauses of the standard have been aligned with the format being applied for all Indian Standards on code of safety of chemicals.

1 SCOPE

1.1 This standard prescribes general properties of aniline, and the nature of hazards associated with it.

1.2 This standard also covers other essential information such as information on storage, handling, packing, labelling, disposal of waste, cleaning and repair of containers, selection and training of personnel, protective equipment and first-aid.

1.3 This standard does not deal with specification for design of buildings, chemical engineering plants, storage vessels, equipment for operations control and waste disposal.

2 REFERENCE

The Indian standards listed in **Annex A** 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 revision, and parties to agreements based on this standard are encouraged to investigate the possibility of applying the most recent editions of the standards.

3 TEMINOLOGY

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

4 PROPERTIES

4.1 General Information

Aniline is a primary arylamine in which an amino group replaces one hydrogen atom on a benzene ring. It is commonly used as a chemical intermediate in the production of dyes, polyurethane foams, agricultural chemicals, rubber processing additives, and resins. Additionally, aniline serves as a solvent and was previously utilized as an antiknock agent in gasoline. Derivatives of aniline are used to manufacture varnishes, perfumes, medicinal products, and shoe polishes. Aniline hydrochloride is specifically used in the production of dye intermediates, including aniline black, and for dyeing fabrics and wood black.

4.1.1 *Chemical Name* — Aniline

4.1.2 *Common Name & Synonyms*— Anilin; Cyanol; Aminobenzene; Benzeneamine.

4.1.3 *Uses*

Aniline is mainly used as a chemical intermediate in producing dyes, agricultural chemicals, polymers, and rubber products. It also functions as a solvent and has been used as an antiknock compound in gasoline. Additionally, aniline is involved in manufacturing medicinal products, resins, varnishes, perfumes, and shoe polishes. Aniline hydrochloride is specifically used in dye intermediates and fabric dyeing, with a concentration limit of 0.0005% in tattoo inks and permanent makeup. Aniline plays a role in preparing pharmaceuticals and is also used in producing rubber accelerators, antioxidants, photographic chemicals, isocyanates, explosives, and various agricultural chemicals.

4.2 Identification

4.2.1 *Formula* — $C_6H_5NH_2$

4.2.2 *CAS Number* — 62-53-3

4.2.3 *UN Number* — 1547

4.2.4 *UN Class* — 6.1

4.3 Physical Properties

4.3.1 *General*

Aniline is a transparent, oily liquid that is colorless to pale yellow when freshly distilled, and it has a strong, characteristic odor. Upon exposure to air, it darkens and eventually turns brown. It has a low vapor pressure at room temperature. Aniline is slightly soluble in water but is miscible with most organic solvents.

4.3.2 *Molecular Mass* — 93.13 g/mol

4.3.3 *Physical State* — Transparent oily liquid

4.3.4 *Colour* — Colourless to pale yellow when freshly distilled, darkens on storage.

4.3.5 *Odour* — Characteristic amine odour.

4.3.6 *Boiling Point* — 184.2 ℃ at 760 mm Hg.

4.3.7 *Crystallizing Point* – 6.4 °C

4.3.8 *Melting Point* — (-) 6.0 °C.

4.3.9 *Relative Density* — *see* **4.3.11**

4.3.10 *Relative Vapour Density (Air=1)* — 3.3

4.3.11 *Specific Gravity*

Liquid (water = 1) at 20 °C — 1.022

4.3.12 *Viscosity*— 4.4 mPa.s *at 20 °C*

4.3.13 *Vapour Pressureat 20 °C* — 0.5 mm Hg

4.3.14 *Heat of Combustion* — (-) 3 392.8 KJ/mol

4.3.15 *Refractive Index*— 1.586 3 at 20 °C

4.3.16 *Solubility in Water* — 36 mg/mL at 25 °C

Temperature (°C)	*Aniline in Water, Percent*	*Water in Aniline, Percent*
25	3.5	5.0
90	6.4	9.9

4.3.17 *Solubility in other solvents* — Aniline is miscible (completely soluble) with ethyl alcohol, benzene, ethyl ether, chloroform, carbon tetrachloride, acetone and most of the other organic solvents.

4.3.18 *Light Sensitivity* — Tends to darken on exposure to air and light.

4.3.19 *Hygroscopicity* — Not hygroscopic.

4.4 Chemical Properties

4.4.1 *Reactivity*

Aniline is a heat-sensitive base that reacts vigorously with strong oxidants, acids, acetic anhydride, chlorinated compounds, beta-propiolactone, and epichlorohydrin, posing fire and explosion hazards. It reacts violently with perchloric acid, nitric acid, sodium peroxide, and ozone. It forms salts with acids and can release flammable hydrogen gas when reacting with alkali or alkaline earth metals like sodium, potassium, and calcium. Aniline is incompatible with albumin, iron, zinc, aluminum solutions, and acids. It readily combines with phenols and aromatic amines and is easily acylated and alkylated. Explosive reactions can occur with compounds such as benzenediazonium-2-carboxylate, dibenzoyl peroxide, and fluorine nitrate, while contact with substances like toluene diisocyanate and various peroxides may lead to ignition or detonation.

4.4.2 *Polymerisation* — Darkens on exposure to air and light and polymerizes to a resinous mass.

4.4.3 *Allotrope formation* — Not applicable

4.4.4 *Corrosion properties*

Aniline is slightly corrosive to metals, particularly to amphoteric ones like aluminum, copper, tin, zinc, and their alloys (such as brass and bronze), making them unsuitable for use.

4.5 Fire and Explosion Hazard Properties

4.5.1 Ignition Temperature — No information available

4.5.2 Auto Ignition Temperature — 630 °C

4.5.3 Flash Point:

a) Open Cup — 75.6 °C

b) Closed Cup — 75.0 °C

4.5.4 Explosive Limits:

a) Lower Explosive Limit - 1.3% (v/v in air)

b) Upper Explosive Limit - 11% (v/v in air)

4.5.5 Flammability – Flammable

4.5.6 *Fire Risk*

4.5.6.1 At normal temperature, aniline is slightly volatile and there is no danger of explosion.

4.5.6.2 Aniline is a combustible liquid, having a flash point of about 76 °C. When aniline is heated to its decomposition temperature (about 190 °C) or catches fire, it emits highly toxic fumes. Beyond about 600 °C it may auto-ignite. Aniline in the concentration range of 1.3% to 11% v/v in air can form explosive mixture. Hence aniline poses moderate fire and explosion hazard when conditions are conducive.

4.5.6.3 The relative density of aniline is 1.018 at 27 °C which is greater than that of water. Since, however, the former becomes less than the latter in the vicinity of 100 °C , aniline floats on the surface of water and the mixture becomes very flammable.

4.5.6.4 Once aniline contacts fuming nitric acid or concentrated nitric acid, it reacts fiercely and catches fire. Contact of aniline with perchloric acid, sodium peroxide, and ozone may be violent.

5 HAZARDS ASSOCIATED WITH ANILINE

5.1 General Information

Aniline should be handled with care as it is a potential carcinogen. Hence exposure to aniline should be limited to as low as reasonably achievable (ALARA). It is a skin and eye irritant on contact. Inhaling aniline irritates nose and throat. If it penetrates into blood through skin or inhalation of its vapour, individual suffers from acute or chronic toxicosis.

5.2 Routes of entry

5.2.1 *Skin*

Skin contamination is the most common route of occupational exposure to aniline. Since, aniline is soluble in fat, it is easily absorbed through skin. It can cause local effects, such as contact burns, as well as systemic toxicity, including methemoglobinemia. Additionally, contaminated clothing can significantly increase the risk of exposure.

5.2.2 *Eyes*

Aniline is a severe eye irritant. Direct contact can cause redness and may lead to potential long-term damage if the exposure is severe.

5.2.3 *Ingestion*

Aniline is toxic if ingested and can lead to serious systemic effects, including nausea, cardiac arrhythmias, shock, and potentially death.

5.2.4 *Inhalation*

Inhalation of aniline vapors is toxic and can cause symptoms of methemoglobinemia, such as cyanosis, headache, and nausea, even at concentrations ranging from 5 to 53 ppm.

5.2.5 *Long term effects*

Prolonged or repeated exposure to aniline can cause damage to the blood, liver, and nervous system, primarily through the development of methemoglobinemia. Repeated exposure of aniline may also cause genetic defects, and aniline can be carcinogenic to humans, with potential links to bladder cancer.

5.3 Toxicity information

a) Threshold Limit Value (TLV-TWA): 2.0 ppm (*ACGIH*)

b) Short Term Exposure Limit (STEL): 5 ppm (*OSHA*)

c) Immediately Dangerous to Life or Health (IDLH): 100 ppm (*NIOSH*)

d) Lethal Dose (LD_{50}): for Rabbit (Dermal): 820 mg/kg

: for Rat (Oral): 250 mg/kg

e) Inhalation (Mouse) Lethal Concentration (LC_{50}-4 hour): 248 ppm

5.4 Antidote

For aniline poisoning, National Institute of Health (NIH) has recommended that methylene blue can be used as an antidote. However, it should be prescribed and administered by medical expert. Seek medical help in case of severe exposure.

5.5 Health Effects

Aniline is highly toxic and can cause methemoglobinemia, a condition that reduces the blood's ability to carry oxygen. Symptoms include headache, dizziness, fatigue, rapid heartbeat, shortness of breath, and bluish skin or lips. Severe cases may lead to confusion, respiratory distress, collapse, and death. As little as 0.25 mL can cause poisoning, with a lethal dose around 10 grams for a 150 lb person. Aniline is also highly toxic by inhalation, ingestion, and skin contact. It can cause eye and skin irritation, dizziness, nausea, and liver and kidney damage, with effects worsened by alcohol. It is a suspected human carcinogen, with TLV-TWA of 2 ppm.

5.5.1 *Signs and Symptoms*

Symptoms of aniline poisoning include irritation, nausea, headache, vomiting, shortness of breath, and effects on the central nervous system. Prolonged exposure may also cause damage to vital organs such as the liver, kidneys, spleen, and bladder.

Sl. No. **(1)**	**Concentration of Airline in the Air** (2)		**Symptoms** **(3)**
	mg/m^3	ppm	
i)	30 to 100	7 to 26	Light symptom appears, in case the vapour is inhaled for a long time
ii)	400 to 0.600	105 to 160	The maximum concentration at which man can breathe for an hour without trouble.

5.5.2 *Acute Toxicity*

5.5.2.1 *Systemic effects*

5.5.2.1.1 Aniline causes the conversion of hemoglobin to methemoglobin. The latter compound cannot release the oxygen necessary for adequate body metabolism. The evidences of poisoning are secondary to the resultant loss of oxygen carrying capacity of the blood.

5.5.2.1.2 The clinical picture of aniline poisoning varies with the intensity of the exposure. Moderate exposure to aniline may cause only a bluish discoloration (cyanosis) of the cheeks, lips, ears, finger nail beds, etc, with no subjective symptoms; however, there may be a temporary sense of well— being or exhilaration due to the slight decrease of oxygen in the blood. As the oxygen deficiency increases because of the formation of more methemoglobin, the cyanosis may be associated with headache, weakness and irritability. In more severe exposures, headache, palpitation, dizziness, drowsiness and shortness of breath are often present; eventually the patient may become unconscious and collapse. If treatment is not rendered promptly, death can occur.

5.5.2.2 *Local effects*

Aniline is mildly irritating to the eyes and may cause corneal damage. Therefore, following a splash, the eyes should be flooded with copious amounts of water for at least 15 minutes holding the eyelids apart, if necessary. It is advisable for a physician to see all such cases.

5.5.3 *Chronic Toxicity*

5.5.3.1 *Systemic effects*

Repeated skin or respiratory exposure to low concentrations of aniline may produce headache, irritability, dizziness, insomnia, decreased appetite, pallor and low grade secondary anaemia. The blood may contain methemoglobin, the red cells may show Heinz bodies and aminophenol may be present in the urine. All clinical and laboratory manifestations disappear with no permanent residual pathology demonstrable upon complete cessation of exposure**.**

5.5.3.2 *Local effects*

Aniline may cause local eruption of skin on contact. Hyperemia of conjunctiva may result if it comes in contact with eyes.

6 PERSONAL PROTECTIVE EQUIPMENT

6.1 Availability and Use

6.1.1 While personal protective equipment is not an adequate substitute for good safe working conditions, adequate ventilation, and intelligent conduct on the part of employees working with aniline, it complements these safety measures. Also in several instances, it may be the only practical means of protecting the worker, particularly in emergency situations.

6.1.2 The correct usage of personal protective equipment requires the education of the worker in proper employment of the equipment available to personnel.

6.1.3 Under conditions which are sufficiently hazardous to require personal protective equipment, its use should be supervised and the type of protective equipment selected should be capable of control over any potential hazard.

6.2 Non-Respiratory Equipment

6.2.1 *Eye and face Protection*

6.2.1.1 *Chemical safety goggles*

Cup type of rubber framed, goggles, equipped with the approved impact resistance glass or plastic lenses, should be worn while handling aniline. Goggles should be carefully fitted (*see* IS 8520).

6.2.1.2 *Face shields*

Plastic shields (*full length,20cm minimum*) with forehead protection shall be worn over safety protection goggles (*see* IS 8520).

6.2.1.3 *Spectacle-type safety goggles*

Metal or plastic rim safety spectacles with unperforated side shields should be used where continuous eye protection is desirable. If person is using corrective lenses he/she shall wear the safety goggles over that. These types, however, should not be used where complete eye protection against aniline is needed (*see* IS 8520).

6.2.2 *Head Protection*

'Hard' hats should be worn where there is danger from falling objects. If hard hats are not considered necessary, soft brimmed hats or caps may be worn to give protection against liquid leaks and splashes (*see* IS 8519).

6.2.3 *Foot and leg Protection*

Leather or rubber safety shoes with built-in steel toe caps are recommended. Rubbers may be worn over leather safety shoes. Leather shoes (*see* IS 10667) should be discarded after any contact with aniline. PVC blend boots or safety footwear [IS 15298 (Part 2)] should be used while handling aniline.

6.2.4 *Body, Skin and Hand Protection*

6.2.4.1 While handling aniline may use full body protection (*Pressure suits*) **s**uits with breathing air supply as it protects full body from chemical splash, inhalation of vapour made of polyvinyl chloride and neoprene rubber or suitable impervious protective material and properly designed, should be used wherever complete body protection (*see* IS 8519) is necessary.

6.2.4.2 Aprons made of rubber or other suitable protective material should be used for protection against accidental contact.

6.2.4.3 Affected areas should be thoroughly washed with soap and water, excluding the eyes. To protect against splashes, gloves and aprons made of neoprene or other impervious materials can be worn. These garments should be cleaned inside and outside each time they are contaminated.

6.2.4.4 Sleeves made of suitable protective materials should be worn when the need for complete arm protection is indicated.

6.2.4.5 When cleaning, inspecting, or repairing tanks, safety equipment, such as safety belts, rescue harness, life-line, protective clothing and gas masks should be worn as required by the specific nature of the work and the hazards involved.

6.2.4.6 Frequent inspections and necessary repairs should be made of all personal protective equipment so that the wearer will be adequately protected. Neoprene rubber and other impervious apparel must be checked frequently for signs of deterioration due to exposure to aniline.

6.2.4.7 All contaminated clothing, including gloves, shoes, coveralls, etc., should be removed as soon as possible after exposure to avoid prolonged contact with aniline. It should be thoroughly decontaminated and cleaned before re-use.

6.3 Respiratory Equipment

6.3.1 Severe exposure to aniline may occur when decontaminating areas following spills, or in case of failure of piping or equipment. Employees who may be subject to such exposure should be provided with proper respiratory protection and trained in its use and care. The appropriate respiratory equipment are mentioned in **6.3.2** to **6.3.5.**

6.3.2 *Self-contained breathing apparatus (SCBA)*

Self-contained breathing apparatus (SCBA) permits the wearer to draw air from the cylinder which is the part of the apparatus [*see* IS 10245 (Part 2)]. SCBA allows considerable mobility. The length of time a self-contained breathing apparatus provides protection varies according to the amount of air, regenerating material carried.

6.3.3 *Positive pressure hose masks*

Air shall be supplied by blowers requiring no internal lubrication. The wearer shall be able to use the same route for exit as for entrance and shall take precautions to keep the hose line free of entanglement. The air blower shall be placed in an area free of contaminants.

6.3.4 *Air Line masks[see IS 10254 (Part 3)]*

This type of devices are supplied with clean compressed air. These masks are supplied with air piped from a air compressor. It is extremely important that the air supply is taken from a safe source and that it is not contaminated by oil decomposition from inadequate cooling at the compressor. The safer method is to use a separate compressor of the type not requiring internal lubrication. Pressure reducing and relief valves as well as suitable traps and filters shall be installed at all mask stations.

6.3.5 *Canister type gas masks*

These devices are equipped with full face piece, fitted with the proper canister (organic vapour), approved for absorbing aniline vapour . These will offers protection against concentration not exceeding 2 percent by volume when used in accordance with manufacturer’s instructions. The mask should be used for relatively short exposure periods only. They may not be suitable for use in an emergency since, at the time, the actual vapour concentration is unknown and an oxygen deficiency may exist. The wearer shall be warned to leave the contaminated area immediately on detecting the odour of a harmful vapour. This may indicate that the mask is not functioning properly, that the vapour concentration is too high, that the canister is exhausted or that the mask is not properly fitted.

CAUTION*:* i. Filter type respirators do not offer protection against gases and are unsuitable for use when working with aniline.

ii. The oxygen content of the air in the work environment shall not be less than 16 percent by volume.

NOTE — Respiratory protective equipment shall be carefully maintained, inspected, cleaned and sterilized at regular intervals and always before and after use by another person.

7 STORAGE, HANDLING, LABELLING AND TRANSPORT

7.1 General

7.1.1 All personal handling aniline should use proper personal protective equipment. Appropriate firefighting equipment should be available in the vicinity while handling aniline. Persons handling aniline should have adequate training in use of firefighting equipment.

NOTE — The storage shall be as per the criteria given in the relevant schedule of the M*anufacture, Storage and Import of Hazardous Chemicals Rules,* 1989. While referring to the statutes, the stipulations given in the latest amendments of those statutes shall be taken into account.

7.1.2 The manufacturer/producer of aniline shall issue material safety datasheet (MSDS) for all its user for comprehensive safety details. The MSDS shall be in format as prescribed in IS 17889. MSDS translation in local languages may be provided as required.

7.1.3 *Building Design*

Not less than two means of escape should be provided for each separate room or building in which aniline is stored, handled or used. All exit doors should open out in the direction of travel and should be provided with panic hardware.

7.1.4 *Equipment Design*

7.1.4.1 *Storage*

Aniline is commonly stored in a mild steel tank (*see* IS 2552).

7.1.4.2 *System Type*

A closed type system shall be used in handling aniline. In open or partially open systems, care shall be taken to prevent the escape of vapors into areas where the toxic properties might be a hazard to personnel. Vents equipped with flame arresters (flash screens) are necessary for aniline storage tanks if the tank contents are heated or the tank is so located that it may be exposed to fire, heat or sun.

7.1.5 *Ventilation*

Good ventilation is essential in storage rooms or area where aniline is handled to prevent the accumulation of toxic vapors which have a comparatively low threshold limit in air. Aniline vapour is 3.22 times heavier than air, and its removal requires consideration of such factors as dead air spaces, temperature, air currents, wind directions, etc. Mechanical ventilation should be provided at the most likely points of origin and area ventilation intakes should be located close to floor level. All ventilating systems require periodic inspection. Under abnormal conditions, such as spills or leaks, all available ventilation should be used.

7.1.6 *Electrical Equipment*

All wiring and equipment should be installed in flameproof enclosures as per IEC 60079-1 (2001). In situation where material is handled at temperatures near or in excess of its flash point temperature, wiring and equipment should be as per requirements of the above mentioned standard.

7.2 Storage

7.2.1 Install a lightning conductor on the tank and the store house.

7.2.2 Keep them away from fire, gas burners, furnaces, welding devices and any other installations which may cause spark.

7.2.3 Post the signs of ‘Danger’ and ‘No smoking’ at the tank and the store house.

7.2.4 Earth every tank to prevent static electricity from accumulating.

7.2.5 Every tank shall be tightly sealed. The Tank shall have a vent pipe with a flame arrester.

7.2.6 Build a dike around a large field storage to keep the liquid from flowing out beyond the dike in case the tank is broken.

7.2.7 Inspect every tank of aniline periodically, and keep it under safe conditions.

7.2.8. For the storage of aniline, carbon steel or cast iron are suitable materials. However, if minimizing discoloration is essential, aniline should be stored and transported in stainless steel containers with proper nitrogen blanketing to prevent degradation.

7.2.9 Store containers tightly sealed in a dry, well-ventilated location. After opening, ensure containers are properly resealed and maintained in an upright position to prevent spillage or contamination.

NOTE — Recommended storage temperature: 15 °C to 25 °C

7.3 Handling

7.3.1 General

Each consignment should be unloaded carefully to prevent damage. Each container should be examined carefully for leaks. If leakage is found, it should be handled with particular care to prevent further leakage and removed to a safe place where the leak can be stopped and contents transferred to another container. The general handling practices given in **7.3.2** to **7.3.3** should be followed.

7.3.2 *Precautions During Transportation*

7.3.2.1 Aniline should never be transported along with incompatible materials, particularly oxidizing materials.

7.3.2.2 Sufficient care shall be taken during the transportation not to drop the containers and cause accident.

7.3.2.3 During the transportation, put a sign in a prominent place indicating the existence of hazardous material.

7.3.2.4 Cover the container with suitable materials to shield from sunlight.

7.3.2.5 Be sure that there is no fire nearby when aniline is unloaded. No smoking is allowed.

7.3.2.6 Check whether or not there is any leakage at every delivery. If any leak is found, take sufficient care during handling of aniline and place the leaking container in such a way that the leaking part comes to the top and transfer such a container to a safe place and stop the leakage or replace the defective one with a new container which has no leak.

7.3.2.7 Before the container for delivery is loaded or unloaded, it shall be sufficiently earthed to prevent any sparking. Ensure that there should be no gas entrapped in the loading or unloading area.

Since drums are not pressure containers, do not use any compressed air or gas to transfer aniline from the drums.

7.4 Labelling

7.4.1 Each container (including tankers) shall carry an identifying label or stencil as specified in Fig. 1 of IS 1260 (Part 1) or Label Model No. 3 or 6.1 of Annex B of IS 18149. The storage containers shall be labelled or marked to identify as follows:

a) Name of the material;
b) Indication of the source of manufacture;
c) Net mass;
d) Batch number or lot number in code or otherwise; and
   Physical, chemical and toxicological data as per the criteria given in the relevant schedule of the M*anufacture, 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.

7.4.2 Aniline classified as hazardous category 6.1 of Annex B of IS 18149 labelling should be done accordingly in additionally the following cautionary label is recommended for use in combination with any other statements required by statutes, regulations, etc.:

KEEP WELL CLOSED AND PROTECTED FROM HEAT AND LIGHT;

AVOID CONTACT WITH SKIN.

7.4.3 Manufacturers name with label warnings required by regulations or ordinances form part of the label or placard.

7.4.4 Each shipping container shall bear the POISON label (red printing on white background).

7.4.5 Each returnable drum used for aniline shipment shall bear special bung label.

7.4.6 The containers before disposal should be rendered harmless by the user

7.4.7 *Other Precautionary Labels*

The following label text is designed for the product as shipped for industrial use. It is recommended in addition to or in combination with any label warning or other statements required by statutes, regulations, or ordinances. The labelling requirements as per statutory regulations should be observed for containers destined for household use.

DANGER! POISION! EXTREMELY HAZARDOUS!

LIQUID AND VAPOUR RAPIDLY ABSORBED

THROUGH SKIN

7.4.8 Each tanker and each railroad car carrying one or more containers of aniline must bear the "DANGEROUS" placard in addition**.**

7.5 Transport

7.5.1 The transportation shall be as per the guidelines of IS 18149:2023 - Transportation of dangerous Goods – Guidelines. The Rules and Regulations for transportation of hazardous chemicals shall be strictly adhered to. During shipping in drums the materials may have to be stored in such a way that it should fulfil all instruction of storage given under **7.5.1.1** and **7.5.1.2**

7.5.1.1 This shall be transported exclusively in dedicated freight cars or tank cars, which must be properly ventilated to prevent the accumulation of toxic vapors and, as far as practicable, leak-proof.

7.5.1.2 Aniline may react violently when exposed to naked flames, sparks, or ignition-capable equipment; therefore, their presence is strictly prohibited in or near freight cars transporting aniline (flash point: 70°C).

7.5.1 Driver

7.5.1.1 Vehicle driver should be aware of the potential hazards of the load and should know standard procedure (do's and don'ts) in the event of an accident or an emergency.

7.5.1.2 The driver should be familiar with the truck and the ISO-container; it's length, width, maximum speed, height, braking, turning circle etc.

7.5.1.3 The driver should carry TREM card when vehicle is on road.

7.5.1.4 The driver should not board the passengers in transport units carrying dangerous goods.

7.5.1.5 The Driver and his crew should be aware about the necessary requirements for fire-fighting.

7.5.1.6 The drivers should be prohibited from opening the packages containing dangerous goods.

7.5.1.7 The engine shall be shut off during loading and unloading operations.

NOTE — 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 spill/leak should use proper personal protective equipment and firefighting equipment while handling aniline.

8.2 Spillage

8.2.1 *General Information*

8.2.1.1 Inspect frequently the equipment in order to check if any leak takes place and to prevent its occurrence.

8.2.1.2 In case aniline is spilt over the floor, wash it away with a sufficiently large quantity of cold water, and soap or detergent until its odour disappears. In case cool water is not available, *use* dry sand to absorb aniline.

8.2.1.3 In case aniline is found to leak out of a container, transfer such a container to outdoors or to a well ventilated place, and transfer aniline into another container.

8.2.2 *Air Analysis*

Air Analysis of the air for aniline in the work area will give a measure of the effectiveness of engineering control of the vapour. It may be performed to detect leakage of aniline vapors from equipment and also to ascertain the order of magnitude of the health and fire hazard existing in the work area. It should be kept firmly in mind that the use of these instruments and test procedures for the detection of aniline in the air requires specially trained personnel.

8.2.3 *Land Spill (Spill on land)*

8.2.3.1 *Containment*

Containment of aniline in a landfill requires a multi-layered strategy incorporating physical and chemical barriers to prevent leaching into surrounding soil and groundwater. This typically includes the use of engineered liners, leachate collection systems, and, where applicable, in-situ treatment technologies to degrade or neutralize aniline within the waste matrix. These measures are essential to ensure long-term environmental protection and regulatory compliance. Effective mitigation requires prompt containment, soil remediation, and adherence to regulatory guidelines to minimize environmental and health impacts.

8.2.3.2 *Consequence*

Aniline presence in landfills can lead to significant environmental and health risks. Leaching through soil may result in groundwater contamination, posing a serious threat to human and ecological health due to aniline's toxic properties and its potential as a mutagen and carcinogen. Additionally, aniline can harm soil organisms and local vegetation, disrupting the ecological balance and reducing soil fertility in the affected area.

8.2.3.3 *Mitigation*

Area should be promptly secured and the spill contained. Small spills should be absorbed using inert materials such as vermiculite, dry sand, or earth, and placed in sealed, labeled containers for disposal. Minor residues can be absorbed with paper towels and allowed to evaporate under controlled ventilation. For larger releases, direct the liquid into excavated containment areas, with surface flow prevented by soil berms or sandbags. Universal gelling agents may be applied to immobilize the spill, followed by absorption with materials such as fly ash or cement powder.

8.2.4 *Water Spill (Spill in Water)*

Aniline is soluble in water, meaning it has limited solubility in water. Its solubility in water is approximately 36 mg/mL at room temperature.

8.2.4.1 *Containment*

In the event of a spill, cease water use immediately. Notify relevant authorities if the constituent enters sewers or public waterways. Contain the spill using dikes or polyacrylamide (PAM)/SiO2 absorbents to prevent further spread. Prompt action is critical to prevent environmental harm and ensure safety compliance

8.2.4.2 *Mitigation*

Aniline is soluble in water. If it is mixed with water bodies the water cannot be any used. Activated carbon adsorption can be used for removal of aniline from the water. Mitigation plan shall be prepared as per the steps given in the Hazardous and Other Wastes (*Management and Transboundary Movement*) Rules, 2016.

8.3 Leakages

8.3.1 *General Information*

8.3.1.1 In case of any leak of aniline from a drum or tank, isolate all ignition sources from immediate area. Do not touch or walk-through spilled material. Stop leak if it can be done without any risk. Exercise access control procedure in the area 50 m around the spill . Arrange to transfer the contents to another tank or drum in case leak cannot be stopped.

8.3.1.2 In case of leak from a pipeline or storage vessel, aniline will form a pool of liquid on the ground. Cover the spill with equal parts sodium or calcium carbonate, clay cat litter, and sand. Once absorbed, scoop into a plastic pail and add water to dissolve the carbonate.

8.3.2 *Leak from the Truck*

In case of major leaks, arrange to transfer the material in another tanker or fill in barrels/drums. Dripping leaks should be collected in smaller containers.

CAUTION

Eliminate all ignition sources (no smoking, flares, sparks or flames) from immediate area. Use PPEs while handling aniline. Absorb the remaining aniline in sand or inert absorbent avoid inhalation. Use grounded pipes to avoid static charge igniting aniline.

8.4 Waste Disposal

8.4.1 *General*

8.4.1.1 All local and state regulations concerning waste disposal should be complied with.

8.4.1.2 In the interest of economy and avoidance of possible polluting discharge, aniline can be recovered by extraction with water-immiscible solvents or by steam distillation.

8.4.1.3 Aniline is soluble in water and is biologically degradable. As it has a high biochemical oxygen demand, precautions should be taken to avoid shock loading on treatment plants using biological processes.

8.4.1.4 Residues containing aniline should be disposed as per Hazardous and Other Wastes (*Management and Transboundary Movement*) Rules, 2016.

8.4.1.5 Industrial discharge containing aniline shall be treated in the effluent treatment plant as per the CPCB guideline.

9 FIRE PREVENTION AND FIRE FIGHTING

9.1 General

9.1.1 Aniline is a combustible substance. In case of insufficient ventilation and/or in use, it may form flammable/explosive vapour-air mixtures. Vapors are denser than air and may accumulate in low-lying areas. They can travel considerable distances to ignition sources, posing a risk of flashback. In confined spaces, exposure to fire may lead to explosive conditions. Storage containers and their components may rupture violently and be propelled over significant distances in various directions.

9.1.2 Combustion may release toxic fumes such as nitrogen oxides and carbon monoxide. Aniline vapor can form explosive mixtures with air and is incompatible with strong oxidizers, strong acids, and various other substances. Avoid exposure to heat, as hazardous polymerization may occur, resulting in a resinous mass.

9.1.3 The detection system shall be able to sense the presence of smoke or heat during the initial growth period of fires. Various types of detectors which operate at predetermined temperatures or which detect the smoke photo-

electrically or electronically are employed to suit individual risks. Detectors are made to operate audible or visual alarms or both. They are also linked to the fire authority control room. Good as they are, automatic detection systems only detect the fire after it has started. Since fire patrols often discover conditions which might lead to a fire and correct them in time, consideration shall be given to establishing regular fire prevention patrols in addition to automatic systems. All personnel engaged in fire-fighting operations must use appropriate PPEs to prevent exposure.

9.1.4 Move container from fire area if without risk. Cover the spill with equal parts sodium or calcium carbonate, clay cat litter, and sand. Once absorbed, scoop into a plastic pail and add water to dissolve the carbonate.

9.2 Fire Prevention

9.2.1 At any place where large quantity of aniline is used or stored, install hydrants, fire pumps, water jets or air foam facilities besides the extinguishers as specified in **9.3.1**.

9.3 Fire fighting

9.3.1 Fires involving aniline can be extinguished with water when applied in the form of fog or spray. Carbon dioxide, dry chemical and 'alcohol' type foam extinguishers are also effective on small fires.

9.3.2 While fighting fire involving aniline, firemen should be equipped with standard firemen's clothing plus adequate eye protection. If firefighting involves work in closed or confined quarters the firemen shall be equipped with proper respiratory protection.

9.3.3 If the fire gains headway, it would become extremely difficult to fight against the fire because of too fierce flames and toxic gas. The effective method to fight against fire is to enclose the entire fire area with water jet to cool down the area with its latent heat and shut out air with the mass of steam generated around the area.

10 TRAINING

10.1 Safety in handling aniline depends upon the effectiveness of employee education, training and supervision. The education and training of employees to work safely and to use the personal protective equipment and other safe guards provided for them is a responsibility of supervisor. Employee education and training should emphasize the need of handling aniline according to the methods outlined in the manual, in order to avoid spilling or splashing, leaks, burns, inhalation of the vapour of burning material, or ingestion. Unauthorised and untrained employees should not be permitted in areas where aniline is being handled. The work permit shall be issued as per format prescribed in IS 17893.

10.2 Before being placed on the job, all new employees should be instructed thoroughly for the proper handling of aniline. Older employees should be re-instructed periodically. Instructions and periodic drill or quiz regarding the locations, purpose and use of personal protective equipment.

10.3 Each employee should know the location, purpose and maintenance of personal protective equipment (PPEs) and be thoroughly trained when and how to use it. Each employee should know the location of safety showers, fountains for flushing the eyes, and hose lines.

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 aniline.

10.5 Employee should be trained to report to the proper authority about all suspected leaks or equipment failure.

10.6 Employee education and training should include instructions to report to the proper authority all signs of illness.

10.7 Employee education and training should include instructions to report to the proper authority all cases of equipment failure.

10.8 Employee education and training should include instruction concerning the synergistic effect of alcohol ingestion in this type of toxicity.

10.9 Workers should be thoroughly informed of the hazards that may result from improper handling of aniline. They should be cautioned to prevent spills and thoroughly understand that any spills shall be cleaned up immediately. Each employee should know what to do in an emergency and should be Fully informed as to first-aid measures.

11 HEALTH MANAGEMENT, FIRST-AID AND MEDICAL TREATMENT

11.1 Health Monitoring

Aniline is highly toxic but may be handled safely if proper precautions are observed. Toxic levels may be reached in the blood and tissues by absorption of the liquid through the intact skin, inhalation of vapors or ingestion of the liquid. The most common modes of accidental poisoning are spillage of the liquid on the skin or clothing leading to direct skin contact or the prolonged inhalation of vapour under circumstances of inadequate ventilation.

11.1.1 *Personal Hygiene*

Food shall never be stored nor eaten near aniline nor be in the proximity of aniline handling operations. Clothing that has become contaminated with aniline should be promptly removed and thoroughly laundered. Contaminated shoes shall be discarded and replaced. Employees shall take a shower and wash (*see* IS 10592) thoroughly with soap at the end of each work day and immediately after accidental bodily contact due to spillage.

11.1.1.2 Wash hands and face before meal and after work.

11.1.2 *Physical Examination*

11.1.2.1 *Pre-placement physical examinations*

11.1.2.1.1 Candidates with anemia or those addicted to alcohol should not be assigned to jobs involving possible exposure to aniline.

11.1.2.1.2 For handling aniline, it is unsuitable to employ a person having heart and kidney trouble, a syphilitic patient, a person suffering from any urinary disease, especially a calculus person, or having some troubles in the circulation system, a person of allergy or a heavy drinker. Carry out a blood test before employment.

11.1.2.2 *Periodic examination*

11.1.2.2.1 The usual periodic examination normally given by the plant physician in checking general physical condition of workers is all that is required.

11.1.2.2.2 Besides the regular health examination, which is carried out more than twice every year, conduct blood tests every month on the following examination standards in order to check the conditions of workers who may be exposed to aniline and confirm no anaemia case:

S.No	**EXAMINATION STANDARDS OF BLOOD TESTS**				
(1)	(2)				
	State	*Relative Density of Total Blood*	*The Number of Red Blood Cells*	*The Amount of Hemoglobin (g/dl)*	*Remarks*
i)	Normal	More than 1.055	More than 500 000	More than 13.0	Avoid strictly any possessor of parasite eggs and such secondary patients as suffer from tuberculosis, syphilis, etc.
ii)	Careful observation	More than 1.052	More than 4000 000	More than 12.0	
iii)	Rest required	Less than 1.052	Less than 4000 000	Less than 12.0	

Urine tests (urobilinogen , porphyrin, occult blood test, deposit) should be conducted once every two, weeks, especially once a week in summer. It is desirable to carry out the close examination including cystoscopy to a person who is positive in occult blood test.

11.2 First Aid

11.2.1 *General Principles*

11.2.1.1 Contaminated clothing should be removed at once. Speed in removing aniline from the skin is of prime importance. A thorough shower, taken immediately, with plenty of soap and lukewarm water is imperative. The patient should then be transported on stretcher without delay to the medical department or first-aid station for observation and care. Call a physician at once.

11.2.1.2 After making sure that all aniline has been removed from body surfaces the patient should be put to bed and kept warm in a well ventilated room. Bed rest is imperative. If the patient becomes increasingly cyanotic before the arrival of a physician, oxygen may be administered by first-aid personnel who have been thoroughly instructed in this technique. Patients, while conscious, may be given fluids by mouth, preferably those containing sugar, such as orange juice, grapefruit juice, sweetened lemonade or strong black coffee.

11.2.1.3 Alcohol in any form should never be administered to anyone with aniline poisoning. Aspirin or codeine may be used to relieve severe headache but drugs such as acetanilide, acetphenetidine and other methemoglobin formers should not be used. Inhalation of oxygen will transiently relieve headache.

11.2.1.4 In a serious case, practice artificial respiration, oxygen inhalation, bloodletting and transfusion. Give a collapsed patient stimulant for respiration and circulation of blood, such as sodium benzoate and caffeine in order to heat the body, lest the temperature of the body should decline.

11.2.2 *Contact with Skin and mucous Membranes*

In case of contact with skin, remove contaminated clothing and wash immediately with plenty of water. Running water will mechanically remove some of the aniline, at least the gross contamination. It can be readily sponged off with vinegar or lemon juice.

11.2.3 *Contact with Eyes*

In case of eye contact: Immediately flush eyes with copious amounts of water for not less than 15 minutes following any aniline splash, and seek medical attention. All cases should be referred to a physician without delay.

11.2.4 *Ingestion*

11.2.4.1 Accidental or suicidal ingestion of aniline should be treated by the prompt administration of an emetic, such as mustard and water, or the lukewarm emulsion of soap and water, provided the patient is conscious

11.2.4.2 Never give anything by mouth to an unconscious person.

11.2.4.3 Gastric lavage should be instituted promptly by someone who is adequately trained.

11.2.5 *Inhalation*

Inhalation of the vapour of aniline gives the same clinical picture as absorption through the skin or by ingestion, and requires the same treatment.

1l.2.6 *First-Aid Kit*

Ensure medical personnel are informed of the substances involved and take necessary precautions to prevent contamination. Do not perform mouth-to-mouth resuscitation, as the victim may have inhaled or ingested the substance. If a pulse is present and proper equipment is available, wash the victim’s face and mouth, then administer artificial respiration using a medical device such as a bag-valve mask or a one-way valve pocket mask.

11.3 Medical treatment

Subsequent to exposure to aniline, at the First-Aid post of the facility, strictly pursuant to doctor's instructions, the exposed individual may be given suitable medication as part of first aid**.** Administer sodium thiosulphate, vitamin C,

cystine, glutathione, adrenal cortical preparations, folic acid, vitamin B_{12} dextrose or methionine for the antipoison purpose, pursuant to doctor's instructions

11.3.1 If possible while the patient is acutely ill, methemoglobin concentrations of the blood should be determined quantitatively at frequent intervals. Such determinations shall be continued until it is definitely established that the concentration of methemoglobin is steadily decreasing. Methemoglobin may be quantitatively determined by several methods. An intravenous injection of 10 to 20 ml of sodium thiosulphate and a large dose of vitamin C at one time, will contribute to quick recovery. If the concentration of methemoglobin reaches 40 percent in a venous blood sample, 1 000 ml of 5 percent glucose may be administered intravenously.

11.3.2 Oxygen (tent, mask or nasal catheter) serves to relieve headache transiently, apparently due to saturation of the hemoglobin and plasma with oxygen, but does not seem to accelerate the reversion of methemoglobin to hemoglobin.

11.3.3 Under such treatment, acutely toxic patients with methemoglobin concentrations as high as 70 percent in venous blood samples usually make uneventful recoveries within 24 hours, with no demonstrable permanent, residual effect. This is reported to hasten recovery.

11.3.4 It is imperative that patients be closely observed and remain in bed for 24 hours if the methemoglobin content has reached 40 percent. In the rare instances, in which a state of collapse intervenes, respiratory and cardiac stimulants may be administered at the discretion of the attending physician.

12 ADDITIONAL INFORMATION

12.1 Tankers

12.1.1 *Unloading Trucks*

12.1.1.1 Unloading stations should be equipped with safety showers (see IS 10592) and appropriate safety equipment such as unloading hoses, safety shoes (see IS 15298 Part 2), helmets (see IS 8520), and other necessary PPE.

12.1.1.2 The truck should be spotted accurately and levelled. Stoppers/pegs should be used to avoid movement of truck during unloading.

12.1.1.3 Supplier's instructions for unloading should always be followed and all caution markings on both sides of trucks should be read and observed.

12.1.1.4 Tanker unloading should be preferably to tank at same level or at lower level. Truck should not be unloaded to a tank at higher elevation.

12.1.2 *Unloading Drums*

12.1.2.1 Unloading can be accomplished by gravity or siphoning, or by using a pump.

12.1.2.2 Ensure that all fittings are tight.

12.1.2.3 Ensure all drums and receiving containers are properly grounded and bonded before unloading aniline to prevent static discharge.

12.1.2.4 Use conductive transfer equipment and avoid splash filling to minimize vapour and ignition risk.

12.2 Cleaning and Repairing of Tanks and Equipment

12.2.1 *Preparation of Tanks and Equipment*

12.2.1.1 Tank and equipment cleaning should be under the direction of thoroughly trained personnel who are fully familiar with all the hazards and the safeguards necessary for the safe performance of their work. The main hazards are exposure to aniline liquid and to toxic fumes. Fire hazard also may be present.

12.2.1.2 Tanks and equipment, pumps, lines and valves should always be drained and thoroughly flushed with water before being repaired. Workmen should never be allowed to attempt to repair equipment while it is in operation and the lines full. If pipe sections are to be removed and flanges opened, the lower bolts shall be loosened first and although the lines have been flushed, care shall be taken to avoid personal contact with the liquid draining, or dripping from

the equipment. All spillage from the lines or equipment shall be removed immediately by flushing to the drain with large quantities of water.

12.2.1.3 The tank or equipment to be repaired shall first be emptied of all liquid, and all pipes leading to and from the tank (except vents) after draining shall be disconnected or blanked off.

12.2.1.4 The tank should be steamed to remove residual aniline and vapours.

12.2.1.5 The tank should be cooled, preferably by filling with water and draining once or twice.

12.2.1.6 The tank should then be purged with fresh air and the atmosphere shall be tested for aniline vapours and oxygen deficiency.

12.2.2 *Entering Tank*

12.2.2.1 No one should enter a tank or confined space until work permit has been signed by an authorized person indicating that the area has been tested and found to be safe. Furthermore, no workman shall enter a tank or vessel that does not have a manhole opening large enough to admit a person wearing a safety harness, life line, and emergency respiratory equipment. It shall be ascertained that the tank or vessel can be left by the original entrance.

12.2.2.2 When a man enters the tank, one man on the outside of the tank shall keep the man in the tank under observation and another man should be available nearby to aid in case of any risk to the man in the tank.

12.2.2.3 A supplied-air respirator (hose mask) or self-contained breathing apparatus, together with harness and life line shall always be located outside the tank entrance for rescue purposes, regardless of the type of respiratory equipment or air supply which is provided for employees inside the tank. A 'chem-suit' of material impervious to aniline shall be worn.

12.2.2.4 Special ventilation is recommended during the entire time men are cleaning, repairing, or inspecting the tank. Ventilation can be accomplished by exhausting or removing vapors from the bottom of the tank either through its bottom openings, or by exhausting the vapors from the tank bottom by means of a large flexible duct where *tanks* have a top opening only.

12.2.2.5 On tanks having only a top opening, care shall be exercised to ensure complete removal of vapors from the entire tank. Care shall also be taken to avoid having exhaust gases recycled into the tank.

12.2.2.6 During the course of the work, frequent tests should be made to determine that the atmosphere in the tank is being maintained within the safe range. This precaution is necessary because residues not completely removed by washing may recontaminate tank atmosphere.

12.2.2.7 In all cases, if repair work is interrupted, the tank atmosphere should be checked thoroughly and a new work permit issued before resumption of work.

12.2.3 *Emergency Rescue*

Under no circumstances shall a rescuer enter a tank to remove a victim of overexposure without proper respiratory protection, a safety harness and an attached life line. The free end of the life line shall be manned by an attendant located outside the tank. Another attendant should be immediately available to assist in the rescue, if needed. The rescuer should be in view of the outside attendant at all times or in constant communication with him.

12.2.4 *Exterior Repair Work*

12.2.4.1 Exterior tank repairs, including repairs to steam coils, cutting, riveting and welding, should be permitted only after thorough cleaning and testing of the tank to make sure it is free of vapors and after work permit has been issued by an authorized person.

12.2.4.2 All outside welding or burning on tanks or equipment which have contained aniline should be done only after such containers have been completely purged with steam. Purging should be continued while their repair work is in progress. Filling empty tanks with inert gas is another method which may be used in outside welding or burning.

12.2.4.3 In all cases, if repair work is interrupted, the tank atmosphere should be checked thoroughly and a new work permit issued before resumption of work.

Additional information essential for particular equipment used for handling of aniline, Security measures to be taken while handling of aniline etc. as essential for controlling hazards may be collected and applied.

ANNEX A

(*Clause* 2)

LIST OF REFERRED STANDARDS

IS No.	*Title*
IS 1260 (Part 1): 1973	Pictorial markings for handling and labelling of goods Part 1 Dangerous goods (*first revision*)
IS 2833 : 2019	Aniline Technical—Specification (*second revision*)
IS 2925 : 1984	Specification for industrial safety helmets (*second revision*)
IS 4155 : 2023	Glossary of terms relating to chemical and radiation hazards and hazardous chemicals (*first revision*)
IS 8519 : 2024	Guide for selection of occupational protective clothing — Body protection (selection, care, and maintenance) (*first revision*)
IS 8520 : 2023/ ISO 19734 : 2021	Eye and face protection — Guidance on selection, use, and maintenance (*first revision*)
IS 9623: 2008	Selection, use and maintenance of respiratory protective devices - Code of practice (*first revision)*
IS 10245 (Part 1): 1996	Breathing apparatus Part 1 Closed circuit breathing apparatus (compressed oxygen cylinder) — Specification (*first revision*)
IS 10245 (Part 2): 2023	Respiratory protective devices — Specification Part 2 self-contained open circuit breathing apparatus (*second revision*)
IS/IEC 60079 (Part 1) : 2014	Explosive Atmosphere – Part 1: Equipment protection by Flameproof Enclosures “d”
IS 10592 : 2018	Industrial emergency showers, eye and face fountains and combination units — Specification (*first revision*)
IS 10667 : 1983	Guide for selection of industrial safety equipment for protection of foot and leg
IS 15298 (Part 2): 2024	Personal protective equipment Part 2 Safety footwear (*third revision*)
IS 15803 : 2008	Respiratory protective devices — Self-contained closed circuit breathing apparatus chemical oxygen (KO_2) type, self-generating, self-rescuers — Specification
IS17893: 2023	Work Permit System - Code of Practice
IS 18149 : 2023	Transportation of dangerous goods — Guidelines
17889: 2022	Material Safety Data Sheets- Guidelines