भारतीय मानक

Indian Standard

IS 9279 : 2023

एल्युमिनियम फॉसफाइड — सुरक्षा संहिता

(पहला पुनरीक्षण)

Aluminium Phosphide — Code of Safety

(First Revision)

ICS 71.060

भारतीय मानक ब्यूरो
BUREAU OF INDIAN STANDARDS
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Chemical Hazards Sectional Committee, CHD 07

FOREWORD

This standard (First Revision) was adopted by the Bureau of Indian Standards, after the draft finalized by the Chemical Hazards Sectional Committee had been approved by the Chemical Division Council.

Aluminium phosphide formulations in the form of tablets/pellets are widely used to generate phosphine, a fumigant gas, for the control of various types of pests like stored product insects, field rodents, snakes, crabs, etc. Therefore, detailed knowledge about its toxicity and hazards would be useful in ensuring safety in the use of this hazardous chemical. The elimination of accidents is vital to public interest. Accidents produce social and economic 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. Apart from general precautions, some typical precautions are required to be taken during manufacture, storage, and handling of aluminium phosphide. This code describes the properties of aluminium phosphide and nature of hazards associated with it. The standard also prescribes safety measures for controlling hazards and essential information on symptoms of poisoning, first-aid, medical treatment, storage, handling, labelling and employee safety. This standard is intended to guide the users in the recognition of these hazards and in establishing safe handling procedures.

Aluminium phosphide is included in the schedule of approved insecticides under the *Insecticides Rules*, 1971. The properties of aluminium phosphide listed in **4** have been taken from literature and have been included for information only. Moreover, these properties pertain to pure aluminium phosphide. BIS has published a separate standard IS 6438 : 1980, which prescribes the requirements and methods of sampling and test for aluminium phosphide formulations in the form of tablets/pellets.

This standard was first published in 1979. With a view to update the standard based on the experience of last four decades and on the currently available data the Committee felt a need to revise the standard. In this second revision general properties, safety measures for controlling hazards, and essential information on symptoms of asphyxiation, first-aid, medical treatment, storage, handling, labelling and employee safety have been incorporated. In this second revision, Amendment No. 1 December 1981 has been incorporated.

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

In the preparation of this code of safety considerable assistance was derived from the following publications:

a) Basic Guide to Pesticides Their Characteristics and Hazards, Rachel Carson Counsel Inc. 2018;

b) Agricultural chemicals. Book III, Miscellaneous chemicals: fumigants, growth regulators, repellents, and rodenticides, W T Thomson, 1988; and

c) *The Insecticides Act*, 1971.

The composition of the Committee responsible for the formulation of this standard is given in Annex B.

Indian Standard

ALUMINIUM PHOSPHIDE — CODE OF SAFETY

(First Revision)

1 SCOPE

1.1 This code describes properties of aluminium phosphide, nature of hazards associated with it, safety measures for controlling hazards, and essential information on symptoms of poisoning, first-aid, medical treatment, storage, handling, labelling and employee safety.

1.2 This code does not, however, deal with specifications for design of buildings, chemical engineering plants, methods and ingredients used in manufacture, dosages and exposure periods or directions for it is use in fumigation.

2 REFERENCES

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 revisions, and parties to agreements based on this standard are encouraged to investigate the possibility of applying the most recent editions of these standards.

3 TERMINOLOGY

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

4 PROPERTIES

4.1 General Information

Aluminium phosphide is available in the form of pellets/tablets containing aluminium phosphide and other inert ingredients (*see* IS 6438). The pellets/tablets release about 33 percent by mass of phosphine gas, on contact with atmospheric moisture or acids.

4.1.1 *Chemical Name* — aluminium phosphide

4.1.2 *Common Name and Synonyms* — aluminium phosphide, alumanylidynephosphane

4.1.3 *Uses*

4.1.3.1 Aluminium phosphide is used as both a fumigant and an oral pesticide. As a rodenticide, aluminium phosphide pellets/ tablets are provided as a mixture with food for consumption by the rodents. The acid in the digestive system of the rodent reacts with the phosphide to generate the toxic phosphine gas.

4.1.3.2 It is also used for fumigant, rodenticide, and insecticide, etc.

4.2 Identification

4.2.1 *Formula* — AlP

4.2.2 *CAS Number* — 20 859-73-8

4.2.3 *UN Number* — l 397

4.2.4 *UN Class* — 4.3, subsidiary risk 6.1

4.2.5 *Hazchem Code* — 4 WE

4.3 Physical Properties

4.3.1 *General* — greenish to yellow solid

4.3.2 *Molecular Mass* — 57.95

4.3.3 Physical *State* — solid

4.3.4 Colour — greenish to yellow

4.3.5 *Odour* — garlic-like odour

4.3.6 *Boiling Point* — not available

4.3.7 *Melting Point* — 2 530 ºC

4.3.8 *Vapour Density* (*Air* = 1) — not available

4.3.9 *Specific Gravity Solid* (*Water* = 1) *at* 15 ºC — 2.8

4.3.10 *Viscosity at* 30 ºC — not available

4.3.11 *Vapour Pressure at* 25 ºC — not available

4.3.12 *Heat of Combustion* — not available

4.3.13 *Refractive Index at* 25 ºC — not available

4.3.14 *Solubility in Water* — highly react with water

4.3.15 *Solubility in Other Solvents* — not soluble

4.3.16 *Light Sensitivity* — not available

4.4 Chemical Properties

4.4.1 *Reactivity*

Aluminium phosphide is highly reactive with water, such that any contact with moisture will result in decomposition to phosphine gas. Phosphine gas is colorless, flammable, and explosive at room temperature. Therefore, the primary exposure route is via inhalation and absorption by the lungs.

4.4.2 *Polymerisation* — will not occur

4.4.3 *Allotrope Formation* — not available

4.4.4 *Corrosion Properties* — aluminium phosphide liberates phosphine gas cause the corrosion

Aluminum phosphide must be stored to avoid contact with steam, moisture, water, strong acids and oxidising agents as flammable and toxic phosphine gas is released. Store in tightly closed containers in a cool well-ventilated area.

4.5 Fire and Explosion Hazard Properties

4.5.1 *Ignition Temperature* — 38 ºC

4.5.2 *Auto Ignition Temperature* — above 620 ºC

4.5.3 *Flash Point* — not required

4.5.4 *Upper Explosive Limit* — not available

4.5.5 *Lower Explosive Limit* — 1.79

4.5.6 *Fire Hazard*

On contact with moisture or acids, aluminum phosphide preparations rapidly liberate phosphine gas which is flammable.

NOTE — Flammability of phosphine gas appears to be due to traces of diphosphine (P_2H_4), formation of which is controlled during manufacture by adding fire retardants.

4.5.7 *Heat Hazard*

When exposed to fire aluminium phosphide emits highly toxic fumes of phosphorous oxides, which react with water or steam to produce further toxic and flammable vapours.

5 HEALTH HAZARD AND TOXICITY INFORMATION

5.1 General Information

Aluminium phosphide can lead to poisoning either on inhalation of phosphine gas liberated from it or on swallowing. Inhalation of aluminum phosphide can irritate the nose, throat and lungs causing coughing, wheezing and/or shortness of breath. Repeated exposure may damage the lungs, kidneys, and liver.

5.2 Routes of Entry

5.2.1 *Skin*

Dermal absorption of aluminium phosphide may cause redness and burning sensation of the skin.

5.2.2 *Eyes*

Phosphine gas produces no known adverse effects on the eyes. Prolonged exposure to phosphine may cause redness and pain in the eye.

5.2.3 *Inhalation*

Inhalation of phosphine vapour causes sore throat, cough, shortness of breath, headache etc. Prolonged exposure may cause dizziness, nausea, vomiting and diarrhoea. It may also cause respiratory irritation, compromises heart (cardiac) and circulatory functions, depresses the central nervous system, and produces severe gastrointestinal pain.

5.2.4 *Long Term Effects*

Phosphine may cause inflammation of the nasal cavity and throat, weakness, dizziness, nausea,

gastrointestinal, cardiorespiratory, and central nervous system symptomology, jaundice, liver effects, and increased bone density.

5.3 Toxicity Information

The aluminium phosphide is highly toxic. It should be treated with the usual care of handling hazardous chemicals. Available toxicity values are as following:

a) Threshold Limit Value - Time-Weighted Average (TLV-TWA)— 0.3 ppm for 8 h;
b) Short Term Exposure Limit (STEL) — 1.0 ppm;
c) Acute Lethal Dose 50 (LD_{50}) oral — Female rat 25 mg/kg body weight, GHS Category 2;
d) Acute Lethal Dose 50 (LD_{50}) dermal — Female rat 1 852.83 mg/kg body weight, GHS category 4;
e) Acute LC_{50} inhaltion — Female rat 38.945 mg/kg body weight, GHS category 1;
f) No chronic toxicity to man has been observed for phosphine; and
g) Explosion point, lowest 1.79 percent by volume in air.

5.4 Antidote

There is no specific antidote for aluminium phosphide toxicity. Kindly refer the medical treatment (*see* **11.3**).

5.5 Health Effects

5.5.1 Signs and symptoms of poisoning as a result of inhaling liberated phosphine are as following:

a) Slight or mild poisoning

Feeling of fatigue, dizziness, nausea, vomiting, buzzing in the ears, pressing sensation in the chest, intestinal pain, and diarrhea;

b) Medium to severe poisoning

Previous symptoms may be followed by dry cough, dyspnoea, intense thirst, excessive perspiration, pain in the limbs, ataxia, anuria, convulsions and rapid onset of stupor;

c) Signs of poisoning by inhalation include dilated pupils, haemoglobinuria, albuminuria, anaemia, jaundice, and thrombocytopaenia; and

d) In the case of swallowing, aluminium phosphide decomposes by the action of gastric acid in the stomach and severe symptoms of poisoning quickly appear; heavy vomiting is followed by unconsciousness.

5.5.2 *Acute Toxicity*

Phosphine is acutely toxic and exposure to high levels can cause immediate effects. Early symptoms of acute phosphine or phosphide exposure are non-specific and include respiratory problems, cough, headaches, dizziness, numbness, general fatigue and gastrointestinal disturbance (pain, nausea, vomiting and diarrhoea). Effects of exposure to higher levels of phosphine, the onset of which may be delayed by several days or more, include pulmonary oedema, convulsions, damage to the kidney, liver, and heart, may lead to death.

5.5.3 *Chronic Toxicity*

The chronic effects of phosphine exposure can be complicated by acute poisoning but are generally distinct and may include anaemia, bronchitis, gastrointestinal disorders, speech and motor disturbances, toothache, swelling of the jaw, mandibular necrosis, weakness, weight loss and spontaneous fractures. Phosphine is unlikely to cause reproductive or developmental effects. Repeated exposure may lead to cumulative effects.

6 PERSONAL PROTECTIVE EQUIPMENT

6.1 Availability and Use

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 aluminium phosphide, it is in many instances the only practical means of protecting the worker, particularly in emergency situations. One should keep firmly in mind that personal protective equipment protects only the worker wearing it, and other

unprotected workers in the area maybe exposed to danger.

6.1.2 *Eye/Face Protection*

Wear chemical safety goggles and face shield when contact is possible. It is recommended to have an eye wash fountain available in work area.

6.1.3 *Skin Protection*

Avoid repeated or prolonged skin contact. Wear chemical protective clothing for example, gloves, aprons, boots.

6.1.4 The correct usage of personal protective equipment requires the education of the workers in proper employment of the equipment available to him. 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 hazards.

6.1.5 When used in a closed/automated system, personal protection equipment may not be required. When closed system is not possible in case of manual handling, sampling, maintenance, repairs etc use suitable personal protection equipment (PPE).

6.2 Non-Respiratory Equipments

6.2.1 *Eye and Face Protection*

Chemical splash protection as per IS 8520 category H-4. Use of goggles along with full face shield is recommended. Face shield should be of sufficient length to cover the neck portion.

6.2.2 *Head Protection*

Hard hats should be worn where there is danger of 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 2925).

6.2.3 *Foot and Leg Protection*

Leather safety shoes with built-in steel toe caps are recommended for workers handling drums and cans of acetone. Alternately rubber gumboots must be used while handling acetone. Leather leg guard is recommended. Shoes should be thoroughly cleaned and ventilated after contamination (*see* IS 10667).

6.2.4 *Body, Skin and Hand Protection*

Clothing made of impervious materials may be worn to protect the body against the splashes. Rubber gloves should be worn for hand protection. Fireproof overalls should be worn when operations involving acetone fires are encountered (*see* IS 8519 and IS 8807).

7 STORAGE, HANDLING, LABELLING AND TRANSPORT

7.1 General

All personal handling aluminium phosphide should use proper personal protective equipment. Appropriate fire-fighting equipment should be available in the vicinity while handling aluminium phosphide. Persons handling aluminium phosphide should have adequate training in use of firefighting equipment. The product is stable under normal conditions of warehouse storage. Keep container lids tightly closed. Always store aluminium phosphide under lock and key in a dry well-ventilated area away from heat. Do not allow water or other liquids to come in contact. Do not pile up large quantities during fumigation or disposal. Do not open containers in flammable atmosphere. Do not expose the product to atmospheric moisture.

7.2 Storage

7.2.1 *In Production/Formulation Plants*

Always store aluminium phosphide preparations in plainly labelled metal drums in separate closed, dry, well-lit rooms of sufficient dimensions to avoid significant contamination with phosphine gas and far away from rooms/premises used for storing other articles, especially food articles. Keep away from moisture and flame. Storage areas should have adequate suction facilities (for example, blowers, etc), so that good air circulation is maintained. All storage vessels should have safety valves so as to release pressure in case of excess phosphine generation.

7.2.2 *Storage During Transport*

Always store aluminium phosphide preparations in airtight (leak-proof) containers.

7.2.3 Do not allow water or other liquids to contact. Do not pile up large quantities during fumigation or disposal. Open containers only in open place. Do not open in flammable atmosphere. Preferably use up contents of a container at one time. Do not expose the product to atmospheric moisture.

7.3 Handling

7.3.1 *General*

Avoid spillage in to eyes, or contact with bare skin or clothing. Wash hands, feet and face thoroughly after handling. Remove contaminated clothing immediately. Avoid breathing gas from tablets or the dust rising from treated grains.

Avoid breathing gas from tablets or the dust rising from treated grain. Hydrogen phosphide in the head space of containers may flash upon exposure to atmospheric oxygen. When opening, point the container away from the face and body. These precautions will also reduce the risk of exposure to hydrogen phosphide gas.

7.3.2 *Safety Measures*

Always observe the following safety measures while handling aluminium phosphide preparations.

7.3.2.1 *In manufacturing plant*

a) Wear gloves, gas mask with fresh air supply apparatus;
b) Do not inhale fumes or dust;
c) Smoking, drinking, or eating in the plant should be strictly prohibited;
d) Odour of phosphine should never be relied upon as an indication of its poisonous concentration. It would be advisable to monitor it from time to time; and
e) Employees in plant should wash/bathe on leaving work and they should be educated about hazards of aluminium phosphide/phosphine.

7.3.2.2 *In fumigation work*

a) Wear rubber gloves while dispersing tablets by hand;
b) Respirators need not be worn when tablets are being dispersed under conditions where operators breathe concentrations of phosphine gas below threshold limit value of 0.3 ppm;
c) Warning notices should be posted near the fumigation areas to prevent exposure of employees/public to the gas;
d) All copper containing equipment and parts in the godown or other structures should be protected before fumigation starts, by covering and pasting them with wax paper;
e) Never fumigate any commodity except under expert supervision in airtight leak-proof covers, bins, and other storage structures; and
f) Always thoroughly aerate fumigated area for prescribed time interval, before processing fumigated commodity.

7.4 Labelling

7.4.1 The following information shall be incorporated on the labels along with other instructions:

CAUTION

Aluminium phosphide and its fumes are highly toxic. Always open the container in open air. Do not open the container with any sharp metallic device, as due to friction, the contents may catch fire. Do not inhale fumes or dust. Wear protective clothing and respirator during use. Keep the material away from children and domestic animals. Destroy empty containers. In case of signs of poisoning, take the patient in open air and call a physician.

7.4.2 Each container (including tankers) should carry an identifying label or stencil as depicted in IS 1260 (Part 1). The storage containers shall be labelled or marked to identify as follows:

a) Contents of the container;
b) Name and address of the manufacturer or importer of the hazardous chemical; and
c) 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 and *Insecticides Rules*, 1971.

While referring to the statutes, the stipulations given in the subsequent amendments of those statutes shall be taken into account.

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

7.5 Transport

7.5.1 For in plant, mechanised loading and unloading of containers.

7.5.2 Always store aluminium phosphide in dry leakproof containers.

7.5.3 No aluminium phosphide shall be transported or stored in a such way as to come into direct contact with food stuffs. No foodstuffs or animal feeds which got mixed up with aluminium phosphide as a result of any damage to the packages containing aluminium phosphide during transport or storage shall be released to the consignees unless it has been examined for possible contamination by competent authorities, as may be notified by the state government. If any insecticide is found to have leaked out in transport or storage it shall be the responsibility of the transport agency or the storage owner to take such measure urgently to prevent poisoning and pollution of soil or water, if any.

NOTE — If transport of the hazardous chemical is involved it shall be carried out in accordance with the *Central Motor Vehicles Rules*, 1989 and chapter VII of *Insecticides Rule*s 1971. 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 Spillage

8.1.1 *Spill on Land*

8.1.1.1 The source from where spill occurred should be stopped immediately, in case it is safe to do. Immediately apply aluminium tape to the leaking point. Cover the spill to avoid any further contamination of soil and atmosphere. Dispose of spilled aluminium phosphide.

8.1.1.2 Keep all bystanders away. Wear full-length clothing and PVC gloves. Shovel, use self-contained breathing apparatus and collect the spilled material/contaminated absorbent and place in suitable containers. Thoroughly scrub the floor or other impervious surfaces with a strong industrial detergent and rinse with water. If practical, use local mechanical exhaust ventilation at sources of exposure especially to speed the aeration of silos, warehouses, ship holds, containers, etc.

8.1.2 *Spill in Water*

Evacuate the area, cordon and isolate the contaminated water. Intimate the local authority nearby area not to use the water.

8.4 Waste Disposal

The rate of decomposition of a correctly applied fumigant preparation will vary depending on the temperature and moisture conditions to which it is exposed. When the moisture and temperature of the fumigated commodity are high, decomposition of the preparation may be complete after about three days. Loosely applied pellets or tablets leave a greyish-white non-hazardous powder containing a small amount of un-reacted aluminium phosphide which should not present a hazard.

9 FIRE PREVENTION AND FIRE FIGHTING

9.1 Prevention

Provision of flame proof electrical equipment may be made. Open flames should be strictly prohibited inside the plant. Earthing of individual equipment may be done in accordance with IS 3043. No contact with water.

9.2 Fire Fighting

Use dry chemical, soda ash, lime or dry sand. However, in contact with moisture/water releases poisonous gas phosphine, which is flammable. DO NOT USE WATER. Do not confine the spent or partially spent aluminium phosphide fumigant dust, slow release of phosphine may lead to formation of explosive mixture with air. Fire fighters must use self-contained breathing apparatus. Evacuate the area and fight fire from a safe distance. Approach from upwind to avoid hazardous vapours and decomposition products. Used equipments should be thoroughly decontaminated.

10 TRAINING

Safety generally depends, to a great extent, upon the effectiveness of employee's education, proper safety instructions, intelligent supervision and use of safety equipment. Training classes should be conducted to maintain a high degree of safety in handling procedures. Workers should be thoroughly informed of the hazards that may result from improper handling of aluminium phosphide. 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

11.1.1 *Personal Hygiene*

11.1.1.1 Employees in plant should wash bath daily after finishing work. They should report any abnormal condition to medical department.

11.1.1.2 Food should not be stored or eaten near the place where aluminium phosphide is being handled.

11.1.2 *Medical Examination*

All persons who are engaged in the work of handling, dealing or otherwise coming in contact with the aluminium phosphide during manufacture/formulation of aluminium phosphide or being engaged during spraying operation shall be examined medically before their employment and at least quarterly in the case of those engaged in manufacturing/formulation units and yearly in any other cases including operators while in service by a qualified doctor who is aware of risks to which such persons are exposed. Particulars of all such persons, including the particulars of their medical examination, shall be maintained. The blood cholinesterase's level shall be measured at least once a month of all persons working in the manufacturing units. Any person showing symptoms of poisoning shall be immediately examined and given proper treatment. An annual physical examination should be conducted for each employee. He should be instructed to report any illness. Liver function test and complete blood count on annual basis is recommended.

11.1.2.1 Proper records should be kept of medical examinations (**11.1.2)**.

11.2 First Aid Measures and Antidote

11.2.1 *Eye*

Immediately flush with plenty of clean water for 15 min to 30 min. Remove contact lenses if present after 5 min of washing then continue rinsing eye. Get medical attention for further treatment advice.

11.2.2 Skin

In a well-ventilated area, brush or shake off material from clothes and shoes. Prior to laundering allow clothing to aerate in a ventilated area. Take out clothing, shoes, socks, wash with plenty of clean water and soap. Get medical attention for further medical treatment.

11.2.3 *Inhalation*

Take victim to fresh air; make the person lie down in comfortable position. Keep him/her warm. If required, use blanket. In case of difficulty in breathing, give artificial breathing. Do not apply mouth to mouth resuscitation. Get medical attention.

11.2.4 *Ingestion*

If symptoms of poisoning due to swallowing appear, induce vomiting giving 0.2 percent copper sulphate solution which acts as an emetic and also produces insoluble cupric phosphide which can be at once removed by gastric lavage with 1 : 5 000 potassium permanganate solution. Give 25 ml of milk of magnesia or beaten whites of 2 eggs or 3 eggs. Avoid fats and oils.

NOTE — Avoid giving anything through mouth if person is unconscious.

11.3 Note to Physician

If patient has swallowed aluminium phosphide, he/she may be emitting toxic phosphine gas. First Aid and medical staff must take precaution against exposure to phosphine gas emitted by such patient. Treat symptomatically. Give repeated gastric lavage with 0.1 percent potassium permanganate solution till the flushing ceases to smell like carbide (garlic). In

case of pulmonary edema, give hypertonic glucose solution intravenously.

11.4 Antidote

No antidote is known.

12 ADDITIONAL INFORMATION

Aluminium phosphide must be stored to avoid contact with steam, moisture, water, strong acids, and oxidising agents as flammable and toxic phosphine gas is released. Store in tightly closed containers in a cool well-ventilated area and in conformity with legal regulation. This information is based on our present knowledge for your guidance on safety requirements. It is not intended as a specification.

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 2925 : 1984	Specification for industrial safety helmets (*second revision*)
IS 3043 : 2018	Code of practice for earthing (*second revision*)
IS 4155 : 2023	Glossary of terms relating to chemical and radiation hazards and hazardous chemicals (*first revision*)
IS 6438 : 1980	Specification for aluminium phosphide formulations (*first revision*)
IS 8519 : 1977	Guide for selection of industrial safety equipment for body protection
IS 8520 : 2023/ ISO 19734 : 2021	Eye and face protection — Guidance on selection, use, and maintenance (*first revision*)
IS 8807 : 1978	Guide for selection of industrial safety equipment for protection of arms and hands
IS 10667 : 1983	Guide for selection of industrial safety equipment for protection of foot and leg

ANNEX B

(*Foreword*)

COMMITTEE COMPOSITION

Chemical Hazards Sectional Committee, CHD 07

Organization	*Representative(s)*
In Personal Capacity (*1204, Bhumika Residency, Sector 20 Block No 21 Roadpali Klambolinode, Navi Mumbai, 410218*)	SHRI K. S. RAMPRASAD **(*Chairperson*)**
Alkali Manufacturers Association of India, Mumbai	SHRI K. SRINIVASAN SHRI H. S. DAS (*Alternate*)
Bhabha Atomic Research Centre, Mumbai	MS GARIMA SINGH SHRI NISHITH GOSH (*Alternate*)
Central Leather Research Institute, Chennai	DR M. SURIYANARAYANAN
Centre for Fire, Explosives and Environmental Science, Government of India, Ministry of Defence, New Delhi	SHRI S. P. DOBHAL DR AARTI BHATT (*Alternate*)
Central Food Technological Research Institute, Mysore	DR DANDAMUDI USHARANI DR PRASANNA VASU (*Alternate*)
Crop Care Federation of India, New Delhi	SHRI P. N. KARLEKAR DR J. C. MAJUMDAR (*Alternate*)
Defence Research and Establishment, (DRDO), Gwalior	DR PRABHAT GARG DR VIRENDRA VIKRAM SINGH (*Alternate*)
Department of Chemicals and Petrochemicals, Ministry of Chemicals and Fertilizers, Government of India, New Delhi	DR VISHAL CHOUDHARY
Department of Space (ISRO), Bengaluru	SHRI MURALEEKRISHNAN R. MS LAKSHMI V. W. (*Alternate*)
Directorate General Factory Advice Service and Labour Institutes, Mumbai	SHRI H. M BHANDARI SHRI P. G. SATPUTE (*Alternate*)
Gas Industries Association, Mumbai	SHRI SUNIL KHER SHRI ANOOP TANDON (*Alternate*)
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National Institute of Occupational Health, Ahmedabad	DR B. RAVICHANDRAN
National Institute of Technology, Thrichi	PROF S. P. SIVAPIRAKASAM D SREEJITH MOHAN (*Alternate*)
National Safety Council, Navi Mumbai	SHRI A. Y. SUNDKAR SHRI K. D. PATIL (*Alternate*)
Oil Industry Safety Directorate (Min of Pet and Natural Gas), Delhi	SHRI DEVENDAR M MAHAJAN
Pesticides Manufacturer and Formulators Association of India, Mumbai	DR ARCHANA KUMARI DR SANDIP SINGH (*Alternate*)
Petroleum and Explosives Safety Organisation, Nagpur	SHRI M. K. JHALA DR YOGESH KHARE (*Alternate*)
Safety Appliances Manufacturers Association, Mumbai	SHRI MOHAMMAD SHRI DEVANG MEHTA (*Alternate*)
Shriram Institute for Industrial Research, Delhi	DR JAGDISH KUMAR DR DEEP SHANKAR CHATTERJEE (*Alternate*)
Tata Chemicals Ltd, Mithapur, Distt, Jamnagar	SHRI SNEHASHISH A. CHAKRABORTY SHRI D. K. THAKUR (*Alternate*)
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BIS Directorate General	SHRI AJAY K. LAL, SCIENTIST 'F'/SENIOR DIRECTOR AND HEAD (CHEMICAL) [REPRESENTING DIRECTOR GENERAL (*Ex-officio*)]

Member Secretary
MS SHUBHANJALI UMRAO
SCIENTIST 'B'/ASSISTANT DIRECTOR
(CHEMICAL), BIS

Bureau of Indian Standards

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Review of Indian Standards

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